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To evaluate six perceptual-motor attributes of trainable and educable mentally retarded children, a battery of tests was constructed which included body perception, gross agility, balance, locomotor ability, throwing, and tracking; 83 retarded subjects provided reliability data, and their scores, with those of 120 additional subjects, provided normative data. The educable mentally retarded (EMR) and educationally handicapped (EH) groups were significantly superior in all tests to the trainable mentally retarded and Down's Syndrome groups, especially when vision and movement were paired. The Down's Syndrome group evidenced the most marked perceptual-motor deficiencies. EH children had poorer crawling and walking patterns than the EMR's, and these two groups functioned best during late childhood and early adolescence. Children with Down's Syndrome made continual improvement with increased age in tracking ability, gross agility, and in body-part perception. The majority of all subjects had difficulty making left-right identifications relative to their bodies. The correlation between IQ's and total battery scores (based on 37 IQ's) was .63 while the age to total score correlation was .54. (RJ)

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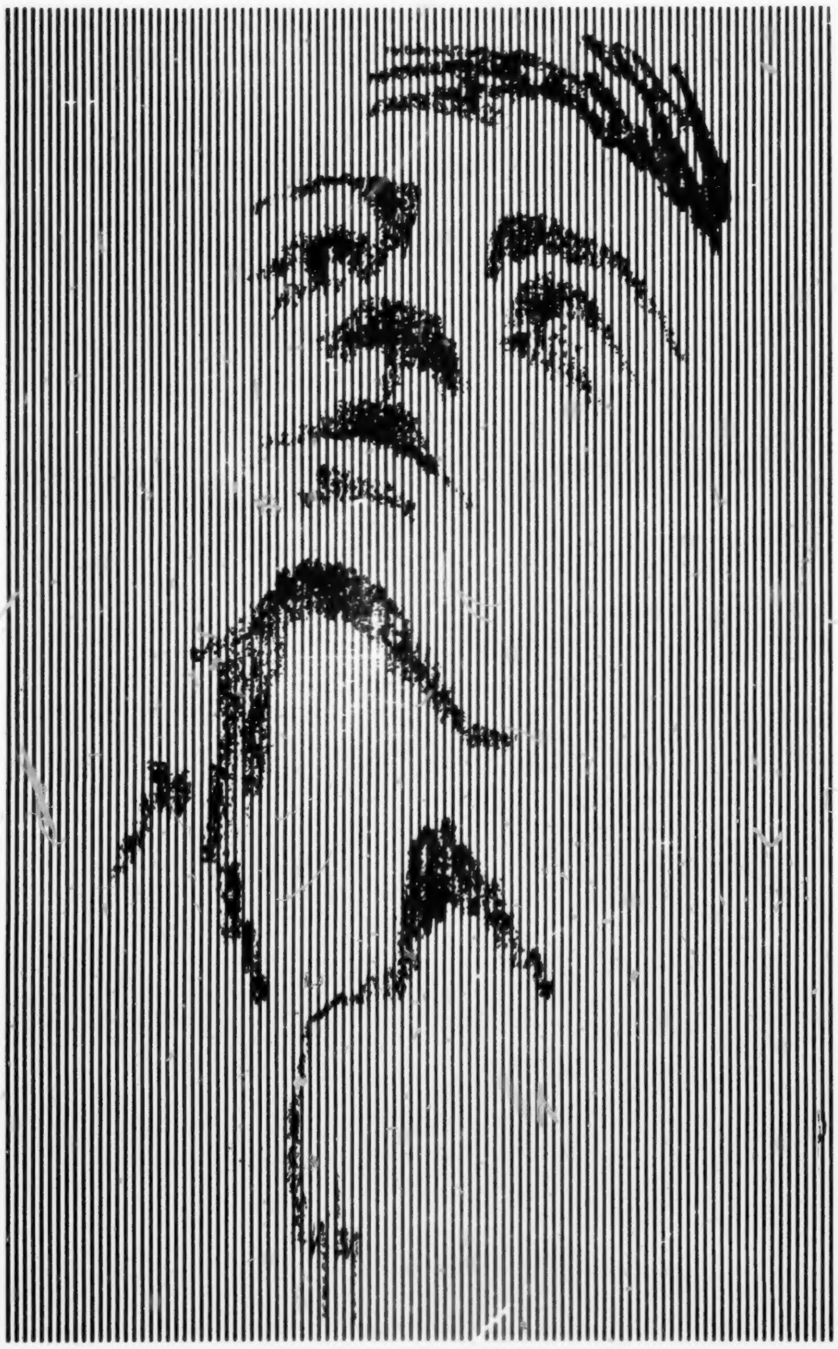

The Perceptual-Motor Attributes of Mentally Retarded Children and Youth

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Sponsored by the Mental Retardation Services Board of Los Angeles County, In cooperation with The Department of Physical Education, University of California, Los Angeles, The Los Angeles County Department of Parks and Recreation and the Special Education Branch of the Los Angeles City Schools.

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PERCEPTUAL-MOTOR ATTRIBUTES OF MENTALLY RETARDED YOUTH

A project sponsored by the Mental Retardation Services Board of Los Angeles County, Dr. Ivy Mooring, Director: In cooperation with the Los Angeles County Department of Parks and Recreation, Mr. N.S. Johnson, Director; the Special Education Branch of the Los Angeles City Schools, Dr. Ernest P. Willenberg, Director; and the Physical Education Department of the University of California at Los Angeles, Dr. Donald T. Handy, Chairman.

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CHAPTER I

INTRODUCTION AND REVIEW OF THE LITERATURE

INTRODUCTION

Studies are appearing in the literature with increasing frequency which deal with the physical ability of children who evidence varying degrees of mental impairment. Some of these articles are descriptions of clinical observations, while others deal with selected measures of physical fitness. Relatively few researchers have concerned themselves with the evaluation of children whose I.Q.'s are below 50, usually classified as Trainable Mentally Retarded. Also scarce are investigations using measures evaluating perceptual-motor attributes which are more comprehensive than simple fitness tests.[1]

The absence of definitive studies has not prevented some "educationalists" from espousing theories which have assumed that through practicing a few simple motor activities a direct route is exposed through which a child's mental functioning, and visual and auditory systems can be improved. These controversial outpourings have proved to be both a boon and an onus to diligent workers in the field of mental retardation. At times these theories have inspired helpful additions to programs in existence, while at other times

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1. The reader is refered to recent summaries of the research on this topic by Stein (18) and Stein and Prangler (19)

the practices some of these theoriticians suggest have resulted in psychological and physical damage to children already suffering from various kinds of impairments.

A survey of the literature points to the need for comprehensive tools with which to survey several kinds of perceptual-motor attributes of mentally retarded children in a minimum amount of time; a series of tasks which attempts to do more than simply count the number of push-ups or sit-ups the child is willing to perform. At the same time, there appears to be a need for a test battery which may be efficiently administered to children whose mental capacities are severly impaired.

Thus it was purposed in this investigation to: (1) Develop a testing instrument designed to evaluate six perceptual-motor attributes of the trainable and educable mentally retarded child and to determine the reliability of the instrument, (2) To formulate norms by age and by degree of retardation based upon the scores obtained from the administration of this test battery so that individual profiles may be compared to meaningful averages; (3) To compare the perceptual-motor abilities of the educationally handicapped, the educable retarded, the trainable retarded, and children with Down's Syndrome. (4) To draw implications for improvement of total educational program of children with learning difficulties.

REVIEW OF THE LITERATURE

Various amounts of attention have been paid by experimentalists to the perceptual-motor abilities of the mentally retarded. Prior to World War II studies in this area were more numerous, while again during the late 1950's and in early 1960's there was an increase in the number of investigations of this nature (18).

Generally studies in this area are prompted by one of two basic premises on the part of investigators. (A) Motoric function is a primary means through which the mentally retarded may be educated and in which they generally evidence less deficiencies than in verbal and cognitive functioning; therefore one should thoroughly explore the nature of these abilities as possible educational tools. (B) Improved fitness and motor ability may enhance the retardant's general feelings about himself which can result in improvement in aspiration level which is reflected in better scores in tests of mental functioning.

Investigations by Hayden (8), Francis and Rarick (7) and others, based upon the first hypothesis, have explored the fitness of retardants. Their findings point to the fact that the retarded are from two to four years deficient in muscular strength and endurance when compared to these same attributes tested in normals. More comprehensive testing programs, utilizing the Sloan revision of the Lincoln-Oseretsky Test which evaluates both fine and gross motor control in a thirty item battery, also point to the motoric deficiencies of the retarded when compared to control groups of normals (15). The most deficient group of retardants when evaluated on motor ability scales has been found to be children evidencing Down's Syndrome (13).

Oliver (12), Schtick and Thate (15) and others have presented findings which suggest that improvement in mental measures may be elicited through participation and improvement in motor activities due to a generalized effect involving an enhancement of the childrens' self-confidence. The most dramatic recent findings of this nature are by Corder (4) who found that retarded boys' intelligence (measured by the verbal scale of the Wechsler) were improved significantly after a program of physical education lasting only twenty days. This latter investigation employed a control group composed of comparable retardants who were not subjected to motor training and whose intelligence test scores did not evidence improvement over a similar period of time. Corder's experimental group contained only eight subjects,however.

Several investigations have provided data which permitted a comparison of I.Q. scores and motor ability traits. In general their findings indicate that with a decrease in mental age, higher inter-correlations between I.Q. (11) (14) and motor ability are likely to be obtained. Whether this increased relationship is due to importance of verbal and cognitive factors which mediate the testing and performance of motor tests or to a real change in the factor structure of motor ability among the retarded still needs to be explored. As might be expected, higher correlations are obtained between the performance of more complex motor activities involving several components in a series and I.Q. than between simple movements (i.e. a vertical jump) and I.Q.

Almost without exception prior investigations of the mentally retarded's ability to move effectively have been conducted using children classifiable as Educable Mentally Retarded, I.Q. between 50 and 70. (5) (12) (9) (11).. Only the investigations by Pertejo (13), and by Kiegel and Reque (10) testing monogoloids present data on children whose mean I.Q.'s are below 50. When evaluating the motor ability of Educable Mentally Retarded, the Sloan Revision of the Lincoln-Oseretsky has been used by several experimenters (14) (11). The California Infant Scale of Motor Development (1) has been employed with some success to evaluate the motor competencies of monogoloids by Stedman and Eichorn (17), and others. The findings of these latter investigations identify the monogoloid child as inferior motorically to other groups of mental retardants.

Moderate correlations are generally obtained between chronological age and motor ability and between mental age and motor ability of the retarded child. The most marked differences in motor ability between the normal and retarded child are found when comparing them in their ability to balance, a common clinical test of brain damage. Howe, for example, found that only two subjects in a group of 43 retarded children from 6-12 years of age were able to balance for one minute on one foot. The mean balancing time for the normals in this study was 53 seconds; whereas the mean time recorded as the retarded children attempted to balance on one foot was 15 seconds! (9)

Many of these previous investigations of the retarded's ability to move effectively have used too few subjects upon which to establish valid norms. The data presented have frequently suffered from a lack of adequate statistical treatment. At the same time the batteries of tests employed have failed to include tasks involving body-part identification, despite the fact that many authorities feel that an inadequate body image is related to mental functioning as well as to motor ability (2) (3). A recent investigation by Guyette, Wapner and others (8), for example, presents findings which suggest that the retarded child becomes more dependent upon modifications in bodily tonus when making various perceptual judgements as he grows older, in opposition to the findings usually elicited from a normal population of children.

In this investigation it was attempted to evaluate a variety of perceptual-motor attributes of a large number of mentally retarded children. The battery of tests which was devised may be administered by a classroom teacher in less than one-half hour per child. A minimum amount of space and equipment is required. The norms derived from these data are based upon the responses of one hundred and seventy-seven mentally retarded children.

The report is divided into five sections. In the chapter which follows this one, general methods and procedures are outlined. A section containing the results follows chapter II. The Fourth Chapter contains implications for the perceptual-motor education of mentally retarded children based upon the findings.

The final chapter presents a summary of the investigation; while the appendix contains rating scales of retarded children classified by age and degree of retardation together with descriptions of the administrative and scoring procedures utilized.

CHAPTER II

METHODS AND PROCEDURES

INITIAL ADMINISTRATIVE PROCEDURES

Preliminary to the establishment of the test battery a meeting of the Advisory Committee was held. The Project Coordinator presented a tentative program of testing to the group and it was decided at that time to obtain normative data and to establish the reliability of a testing instrument during this initial summer of the project.

It was decided by the Advisory Committee that attempting to evaluate the effectiveness of short-term summer programs by testing and re-testing the children participating would not be as helpful as establishing a test battery. Many of the children on the various sites, for example, were found to remain only for a few weeks so that any improvement measured would have to be evidenced after only one or two weeks of training conducted between two administrations of a test.

It was felt by the Advisory Committee that when such a battery was developed it would be useful not only in evaluating the effectiveness of various summer programs but would also be effective in measuring improvement in children participating in year-long programs in the public schools.

Future research and training programs are being planned with this objective in mind.

During the weeks which followed, the Project Consultant met with various sub-groups within the Advisory Committee in order to obtain their advice concerning the nature of final tests to be employed. The following criteria were utilized when formulating the test battery:

1. The administration of the test battery should require a minimum amount of time per child, preferably one-half hour or less.

2. The tests should attempt to survey a reasonably broad sampling of the gross perceptual-motor attributes of retarded children, and include balance, agility, body-part identification, locomotor behavior, and activities in which visual-motor integration is required.

3. The test battery should require a minimum amount of space and equipment for its administration.

4. The tests should be able to be administered to children whose I.Q.'s fall below 50, and include children manifesting Down's Syndrome, those classified as Trainable Mentally Retarded, as well as the Educable Mentally Retarded.

Following meetings with various members of the Advisory Committee a battery of tests was established which included tasks purporting to evaluate six perceptual-motor attributes.

These categories were selected by integrating advice obtained from the various consultants, together with information obtained form a survey of the literature dealing with the motor abilities of mentally retarded children. These categories included Body-Perception, Gross-Agility, Balance, Locomotor-Agility, Throwing, and Tracking. The battery was constructed so that tasks within each of the categories were devised which attempted to assess these attributes at two levels of difficulty. A detailed presentation of the content of these tasks, together with administrative and scoring procedures is found in Appendix A.

Four testers were trained in a two-hour session conducted one week prior to beginning the testing program. Three children were employed evidencing various degrees of retardation, during this training period, to aid the testers and the Project Consultant to better perceive problems which might be expected to occur.

Administrators of programs for the mentally retarded were contacted and their permission obtained for the use of testing facilities and time. Two rooms were obtained at each of two sites at which recreational programs for the retarded were conducted during the summer.[1] A tentative testing schedule was formulated with these administrators during which data on eighty-three children constituting the initial part of the project would be obtained.

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[1] Lokrantz School Annex at San Fernando Valley State College, San Fernando Valley Association's New Horizons School for Retarded Children at Sepulveda.

Data from an additional ninety-seven were obtained through the cooperation of the Los Angeles City School System, Department of Special Education. These children were also tested individually by a Psychometrist on the Staff of the Division of Special Education.

GENERAL TESTING PROCEDURES

The project was divided into two phases. During the initial phase eighty-three children were tested twice on two sites by three testors. It was attempted to test each boy in this initial sampling on consecutive days at the same time of day by a different male testor. The girls in this initial sampling were tested by the same female tester on consecutive days at the same time of the day. The two male testers were not aware of the scores obtained by his counter part on each child. It was the purpose of this initial phase to obtain data relating to the reliability of the testing instrument, to carry out a statistical analysis surveying differences between various groups of retardants, and to obtain various inter-test relationships. The findings based upon data collected during this initial phase of the project are presented in Chapter III which follows.

The second phase of the project involved establishing norms utilizing an additional ninety-three subjects who were tested one time only by the same male testor. The data collected during this second phase were combined with the data collected during the first testing of the children during the first phase of the project.

All of the children were introduced to the testor and were led into an empty classroom with him (her). The tester attempted to establish rapport with the child for a period of twenty minutes. If this proved impossible the child was returned to the group. A second attempt was made to test the child the next day by the same tester and, if this failed, the child was classified as "Untestable."[2] If the child proved testable during this second exposure to the testing situation a third appointment was arranged (during Phase One) in order to obtain two sets of data on each subject. The testers utilized a check sheet when testing the child, and later the data was key punched.

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[2] Less than 10% of the subjects contacted were found to be untestable.

POST TEST ACTIVITIES, DATA ANALYSIS

Individual Profiles, Parent Conferences. Individual profiles were charted which indicated the average level each child tested during the first phase reached on each of the six categories of tests. Group conferences with parents were arranged at each of the two testing sites and, with their childs' profiles in front of them, the parents were oriented as to the general prupose of the testing program, the meaning of the scores obtained by their child, the comparison of these scores to the norms then available, and implications for the education of their children. These conferences lasted about one and one-half hours at each site, and were attended by about seventy-five parents in all.

Individual profiles were also charted for the children tested during the second phase of the project. These profiles were also utilized for parent conferences and were placed in the childrens' educational folders.

Data Analysis. During the first phase of the project the data collected were analyzed in greater detail, than the data collected during the second phase of the project. Scores obtained on the initial eighty-three subjects were utilized to determine the reliability of the testing instrument, as well as to analyze the qualities each of the tests purported to evaluate, by computing correlation matrixes indicating inter-test relationships.

Following the initial phase of the testing the scores obtained during the first testing session of the eighty-three children were correlated to the scores obtained the second time these same children were tested. Pearson Product-Moment Correlations were obtained separately for the Trainable Mentally Retarded, the Educable Mentally Retarded, and for the total population of subjects. Group profiles were charted enabling a visual comparison of the mean scores obtained by the Trainables, the Educables, as well as by the children evidencing Down's Syndrome.

A Fisher's t test was utilized to compare the mean scores obtained by the "Educable" versus the "Trainables" within the initial sampling of eighty-three subjects.

Separate correlation matrixes were computed illustrating the relationships between the various tests, and between each test and the total battery score, evidenced by the "Trainables and Educables," and by the total of eighty-three subjects.

The scores obtained from the subjects within the second phase of the investigation were combined with the scores obtained during the initial part of the investigation, and were key-punched, so that with the aid of an IBM sorter norms were derived which contained scores to which the Educable Retardant, the Trainable Retardant, and the Monogoloid might be compared. These norms were constructed by surveying the mean scores obtained by various age levels within the three groups named above.

Using the above techniques, frequency distributions for the three groups were also obtained, indicating the percent of the various subject populations who successfully completed each task within each of the tests administered. These graphs are found in the chapter which follows. The norms are in Appendix B.

SUMMARY

A test battery was constructed with the aid of consultants in various disciplines together with a survey of the available literature. The test battery surveyed perceptual-motor attributes within six general areas, Body Perception, Gross Agility, Balance, Locomotor Agility, Throwing and Tracking.

In the first phase of the project eighty-three Trainable and Educable Retardants on two facilities were each tested twice in order to establish the reliability of the evaluative instrument. These initial data were also subjected to a statistical analysis which involved computing inter-correlations, by group, of the various tests to each other, and to the total battery score. Individual and Group Profiles comparing the Educable, and Trainable, and the Monogoloids were constructed based upon this initial data for the training of each child tested.

During the second phase of the project one-hundred and twenty children were each tested once. This data together with the scores obtained during the initial testing of the eighty-three children in the first phase of the project were combined to establish norms.

CHAPTER III

FINDINGS

The material which follows has been organized in the following manner. Initially the findings obtained during Phase I of the testing program are presented. These findings, based upon eighty-three subjects, are placed into three categories: Tables illustrating perceptual-motor attributes of the Educable Retarded, data describing the Trainable Retarded, and analyses of scores describing the children with Down's Syndrome. This initial section concludes with a section in which the attributes of the total subject population are described, together with findings which describe the reliability of the test battery.

Phase II of the program produced the findings in the final section of the chapter. This section contains item analyses of the total test battery; together with descriptive data which graphically presents various inter-group differences.

PHASE I

Trainable Retarded: As can be seen in Table I, the mean scores achieved on five out of six categories, and the total

TABLE I

COMPARISON OF THE MEAN SCORES, BY CATEGORY, OF THE TRAINABLE AND EDUCABLE MENTALLY RETARDED

(SUBJECTS IN PHASE I)

CATEGORY	CATEGORY	MEAN	S.D.	σm	M_1-M_2	σ diff.	t	p
BODY PERCEPTION	EMR	6.89	2.24	.53	2.20	.77	2.86	.01
	TMR	4.69	2.51	.32				
GROSS AGILITY	EMR	6.21	2.71	.62	1.94	.69	2.81	.01
	TMR	4.27	2.28	.30				
BALANCE	EMR	6.56	1.83	.44	3.42	.60	5.70	.01
	TMR	3.14	2.93	.38				
LOCOMOTOR AGILITY	EMR	6.5	1.56	.38	2.55	.46	5.54	.01
	TMR	3.95	2.03	.26				
THROWING	EMR	4.65	1.99	.47	1.29	.55	2.35	.05
	TMR	3.66	2.11	.28				
TRACKING	EMR	6.6	2.96	.70	.78	.77	1.01	N/S
	TMR	5.82	2.49	.32				

test battery by the Trainable Mentally Retarded were significantly lower than the means achieved by the Educable Retarded. The most marked differences were seen when comparing scores in the "balance" category, scores obtained in the two agility sections of the battery, and in the section purporting to evaluate "body-perception." No significant differences were found between the Trainables," and the "Educables' when comparing the mean scores obtained in the tracking category, perhaps because the task utilized on the second level (attempting to touch a ball swinging on a string) proved equally difficult for both the Trainable and Educable Retarded.

Further analyses of the "Trainables'" scores in a correlation matrix illustrating inter-test comparisons, revealed other interesting results. As can be seen in Table II, the test most predictive of the score obtained in the total battery was in the section on "body-perception" (r=.91). The scores obtained in the sections on gross agility, in balance and locomotor agility were likewise highly predictive of total achievement in the battery. In general, the correlations were higher than would probably be evidenced by a "normal population of children, indicating the existence of a general factor of some type which probably influenced achievement in a number of tests.

Inspection of the total profile of the Trainable Retardants also reveals that the mean scores fell within level one of the test, even though, if able, the children were permitted to attempt tests in Level II. Therefore, the tasks contained in the initial level are probably of sufficient difficulty to adequately screen a group of Trainable Retarded children. At the same time the tasks within this first level are probably difficult enough to satisfactorily illustrate important differences in the perceptual-motor abilities of retarded children.

TABLE II
INTER-RELATIONSHIPS OF PERCEPTUAL-MOTOR ATTRIBUTES (1st TESTING) OF THE TRAINABLE MENTALLY RETARDED

TEST	1	2	3	4	5	6	TOTAL
1. Body Perception	1.000	+.45	+.62	+.68	+.53	+.51	+.91
2. Gross Agility		1.000	+.58	+.37	+.32	+.37	+.83
3. Balance			1.000	+.65	+.43	+.56	+.73
4. Locomotor Agility				1.000	+.39	+.64	+.77
5. Throwing					1.000	+.38	+.65
6. Tracking						1.000	+.76
7. Total Battery							1.00 N=63

Educable Retarded. In contrast to the Trainable Mentally Retarded, the Educables' score predictive of their achievement in the total battery proved to be in the Balance section. Scoring significantly higher than the Trainables in all sections, the Educables mean scores were all well within the second level of difficulty.

Of additional interest, when inspecting the inter-relationship between various test scores recorded by the Educables, are the moderately high correlations between Agility scores and Body-Perception scores.

As can be seen, however, when contrasting the size of these correlations between tests with those recorded by the Trainable Retarded, there seems to be fewer general factors operative in the various tests. In general the scores obtained from the Educable Retarded are probably more a reflection of various kinds of prior experience, rather than of innate neuromotor capacity.

Using the z score conversion method the mean of the correlations were computed for all groups. The mean of inter-correlations for the Monogoloid children was .465, for the Trainables was .510, and for the Educables was .350. The mean of the inter-correlations for the EMR's was significantly larger than the mean of the TMR's correlations (t=2.71 p.01).

TABLE III
INTER-RELATIONSHIPS OF PERCEPTUAL-MOTOR ATTRIBUTES OF THE EDUCABLE MENTALLY RETARDED. (1st TESTING)

TEST	1	2	3	4	5	6	TOTAL	
1. Body Perception	1.00	+.69	+.25	+.24	+.16	+.42	+.55	
2. Gross Agility		1.00	+.38	+.44	+.12	+.19	+.55	
3. Balance			1.00	+.41	+.19	+.41	+.75	
4. Locomotor Agility				1.00	+.07	+.78	+.65	
5. Throwing					1.00	+.26	+.48	
6. Tracking						1.00	+.58	
Total Battery							1.00	N=20

Down's Syndrome: Comparisons of the scores obtained by the children evidencing Down's Syndrome revealed the expected perceptual-motor deficiencies. Contrasting these scores with scores posted by both the Educable and Trainable Retarded indicate that the Monogoloid children are motorically the least favored. Particular deficiencies are noted in the "Balance" and in the "Gross Agility" categories. The second level task in this latter category requires that the child descend, one knee at a time, to his knees; a task which the Monogoloid could rarely accomplish.

Similar to the relationships evidenced by the Trainable Retarded, the Monogoloid child also posted scores in the category titled Body-Perception which were highly predictive of his total functioning on the test battery (r=.88). Unlike the Trainable Retardant, however, the Monogoloid scores indicate fewer moderate relationships between tests. This latter finding points to the specificity of motor functioning among the Monogoloid population analyzed.

TABLE III
INTER-CORRELATIONS OF PERCEPTUAL-MOTOR ATTRIBUTES (1st TESTING) OF SUBJECT'S WITH DOWN'S SYNDROME

TEST	1	2	3	4	5	6	TOTAL
1.Body Perception	1.00	.59	.46	.89	.63	.34	.88
2.Gross Agility		1.00	.39	.39	.71	.20	.79
3.Balance			1.00	.53	.42	.26	.70
4.Locomotor Agility				1.00	.32	-.05	.57
5.Throwing					1.00	.14	.80
6.Tracking						1.00	.43
7.Total Battery							1.00

Total Subjects: The mean scores obtained from the total subjects indicate that the levels of difficulty required by the tasks contained within the battery are sufficient for the testing of retarded children with a mean age of about thirteen years. The correlation matrix, illustrating inter-test comparisons, indicates that, overall, the balance test is most predictive of the total battery score, (r=.90) while other inter-test comparisons illustrate greater specificity of perceptual-motor functioning than was apparent when surveying these same relationships produced by contrasting scores of the Trainable Retardant. The relative independence of various of the measures obtained on the test battery have implications for motor education programs which are discussed in Chapter III.

TABLE VI
MEANS AND STANDARD DEVIATIONS OF
THE TOTAL SUBJECTS (1st TESTING)

CATEGORY	MEAN	N=83 STANDARD DEVIATION
Body-Perception	5.21	2.58
Gross Agility	4.70	2.85
Balance	3.90	2.67
Locomotor Agility	4.61	2.24
Throwing	3.95	3.61
Tracking	6.09	2.41
Total Test Battery	30.60	11.60

TABLE VII
INTER-RELATIONSHIPS OF PERCEPTUAL-MOTOR ATTRIBUTES OF THE TOTAL SUBJECTS TESTED IN PHASE I

N=83

	1	2	3	4	5	6	TOTAL
Body Perception	1.00	+.66	+.53	+.66	+.54	+.37	+.82
Gross Agility		1.00	+.66	+.61	+.50	+.46	+.84
Balance			1.00	+.61	+.61	+.11	+.90
Locomotor Agility				1.00	+.30	+.54	+.82
Throwing					1.00	+.23	+.69
Tracking						1.00	+.63
Total Battery							1.00

RELIABILITY OF THE TEST BATTERY

Table VIII reveals that the reliability of the total test battery, regardless of the group tested, proves acceptable. Generally tests whose reliability on a test, re-test basis reaches .8 are deemed acceptable for use. The fact that the battery utilized reached .92 when testing both the Educable and Trainable Retarded indicates that it is a reliable

TABLE VIII

TEST RE-TEST RELIABILITY

A. TRAINABLE MENTALLY RETARDED (N = 63)

Test	r
Body--Perception	.78
Gross Agility	.88
Balance	.80
Locomotor Agility	.85
Throwing	.70
Tracking	.80
Total Battery Score	.92

Mean of test r's = .805

B. EDUCABLE MENTALLY RETARDED (N = 20)

Test	r
Body Perception	.73
Gross Agility	.77
Balance	.63
Locomotor Agility	.84
Throwing	.80
Tracking	.80
Total Battery Score	.92

Mean of test r's= .770

C. TOTAL RETARDED SUBJECTS (N = 83)

Test	r
Body Perception	.78
Gross Agility	.82
Balance	.82
Locomotor Agility	.80
Throwing	.75
Tracking	.84
Total Battery Score	.92

Mean of test r's = .803

instrument. The coefficients of the various sub-sections are in most cases equally reliable. With the exception of the Balance task given to the Educable Retarded children, they all reach an acceptable level. It is assumed that the reliability coefficient of the Balance task administered to the Educable Retarded would be higher if more subjects would have been involved in the comparison. (N=20)

Age and Motor Ability. Similar to the findings of the investigations reviewed in the initial chapter, the perceptual-motor scores obtained in this investigation were moderately related to age, (r=+.54). Correlations of I.Q. to test battery scores are presented in the section which follows. I.Q.'s were not available on the subjects tested in the initial phase of the investigation.

Sub-Test Analyses. A detailed analysis of various subtests within several of the categories revealed that, although they apparently tested the same quality, when correlated, it was revealed that they probably evaluated unrelated attributes. The scores obtained when evaluating general manner of throwing in Level I of the test battery were unrelated to the scores obtained as the subjects were asked to throw at a target (r=.03). Thus the total score in this category is a combination of a test evaluating throwing behavior and another measuring throwing with visual direction.

Similarly the two tasks purporting to evaluate locomotor agility were also unrelated. Locomotor agility evaluated in terms of observed behavior was a different attribute than the score obtained when performance in various locomotor tasks in which visual control was necessary (i.e. hopping in squares).(r=16)

The two tasks evaluating Gross Agility in Level I and Level II probably also evaluated diverse qualities (r=.39). The problem of "getting-up for speed" (Level I) probably involved movement speed, reaction time, and explosive strength of the abdominals, leg extensors etc. The four count kneeling task (Level II) probably was dependent upon the subjects' ability to visually organize and to remember a four part direction, and upon dynamic balance as the child ascended and descended to and from his knees.

The two tracking tasks were also unrelated (r=.07). Touching a small swinging ball held on a string was not generally predictive of how well a child could catch a larger ball bounced to him.

Thus when interpreting the findings it must be remembered that the scores within these four categories are in reality combinations of scores obtained from tasks which although apparently evaluating a single quality were actually evaluating two rather different attributes.

PHASE II

In Phase II of the investigation an additional 117 subjects were tested. Twenty three of these subjects were diagnosed as having cerebral palsey and thus their scores were **omitted** from the analyses which follow. The scores of the remaining ninety-four subjects were combined with the scores of the eighty-three subjects tested in Phase I of the investigation. The analyses which follow are based upon the scores of this total of 177 subjects.

The results presented in Phase II are organized in the following manner. Initially various group and inter-group comparisons are presented, including graphs and data contrasting the scores of EMR's to the scores of TMR's etc. Within each section a description of the sub-population is followed by analyses of their performances in each of the six test categories and a graphic description of developmental trends in the data. The chapter concludes with a summary of the findings.

Total Subject Population: 67% of the subjects were male. 2.3% of the subjects were Oriental, 74% were Caucasians, with the remainder (46 subjects) Negro. 46% of the subjects were classified as TMR's, with the remainder of the subjects evenly split between EMR's and Educationally Handicapped (38 subjects

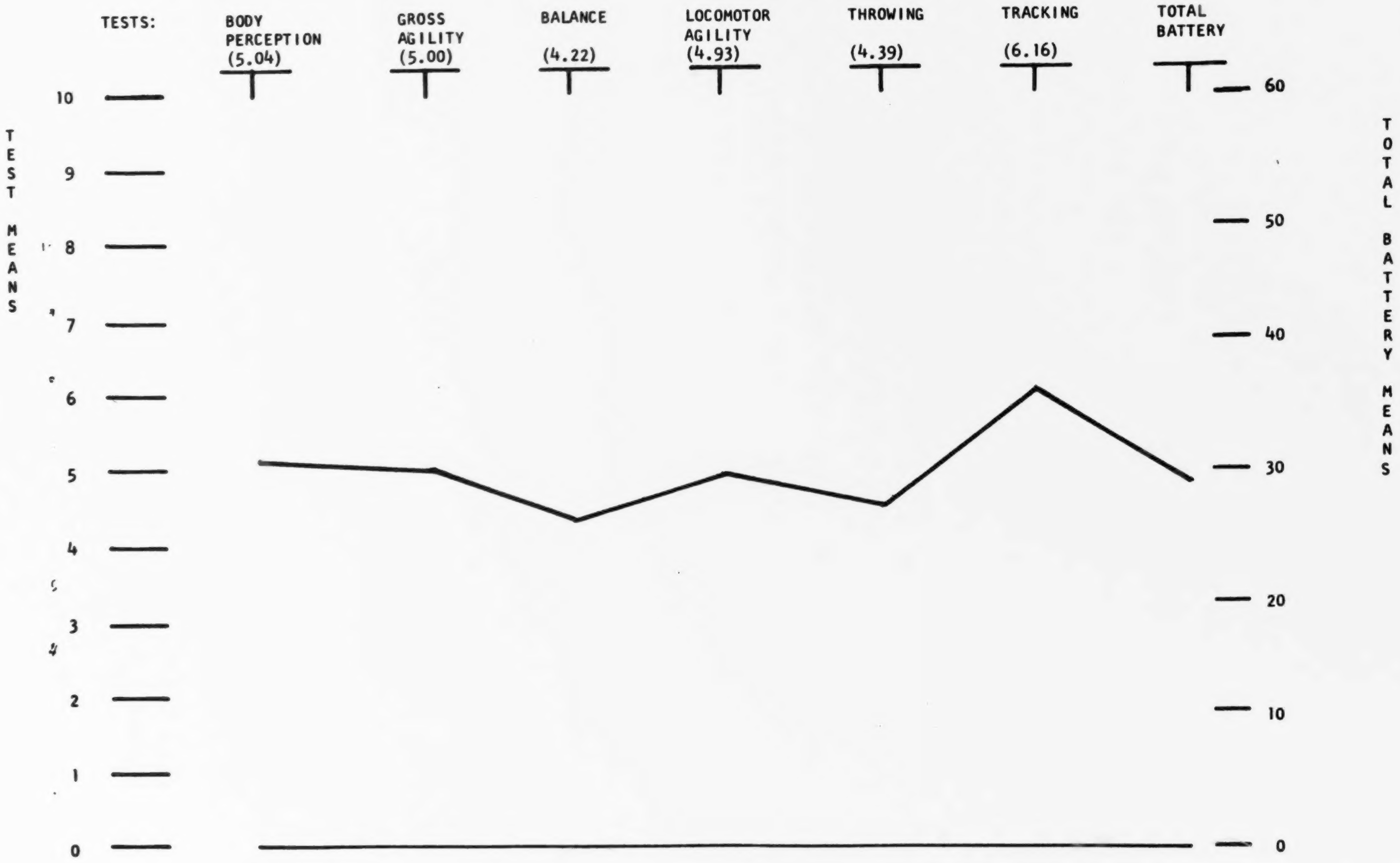
18.2% in each group). 31.8% of the TMR's evidenced Down's Syndrome. Test mean scores indicated that the test battery contained the abilities of the population enabling every child to achieve a minimal score, at the same time placing 'ceilings" on each child's abilities in each of the six categories. The Graph which follows indicates the mean scores achieved by the total population of retardants. The mean age for the total population was 11.40 years, with a range of 5 years to 2 years.

As can be seen upon inspection of Table IX on the average the total subject population was unable to correctly identify left-right hands and legs when asked to do so. In addition they could not repeat a five count agility movement requiring them to kneel on both knees and stand, without the use of their hands; also the total population was unable to progress beyond balancing on one foot for much over six seconds. The subjects' ability to jump and hop into 1' x 1' squares was also lacking as was their ability to accurately throw a 8 1/2' ball into a 2' x 2' square placed on the floor 17 feet away. As was hoped the total battery score of the total group is approximately at the mid-point of the sixty point scale, 29.55, with a standard deviation of 14.02. (Table IX)

A more detailed survey of the percent of the total subjects

TABLE IX

MEAN SCORES OF THE TOTAL SUBJECTS (177) BY CATEGORY



able to perform various sub-tasks within the six categories reveals the following: In the main (89.9%) they were able to lie on their backs and stomachs correctly when it was demonstrated, but as a group they were not able to demonstrate the ability to accurately differentiate between their left and right hands, legs, etc. when it was requested verbally by the tester. Although it might be argued that from 55.5% to 33.3% had an accurate concept of laterality, generally it is considered no more than chance on a two-choice situation (i.e. it is a 50% chance that anyone will identify their left arm correctly when asked to) if less than 75% accurate responses are forthcoming from a group. (Table X)

As was hoped the various sub-tests of the Body-Perception category and of the Locomotor Agility and Balance categories were more difficult toward the terminal end of the lists. The sole exception appears to be the sub-task "lie with your feet nearest me," task #3 in the Body-Perception category, Level I. This task is ommitted in future modifications of the testing battery for this reason. In the other categories in which it was desired that the sub-tasks become increasingly difficult, (Balance, and Locomotor Agility Level II) the decreasing per-cent of the total subject population who were able to perform them (Table X) indicates that this objective was met.

Table X

Percent of Total Subjects Successfully Performing

Tasks Within Six Categories

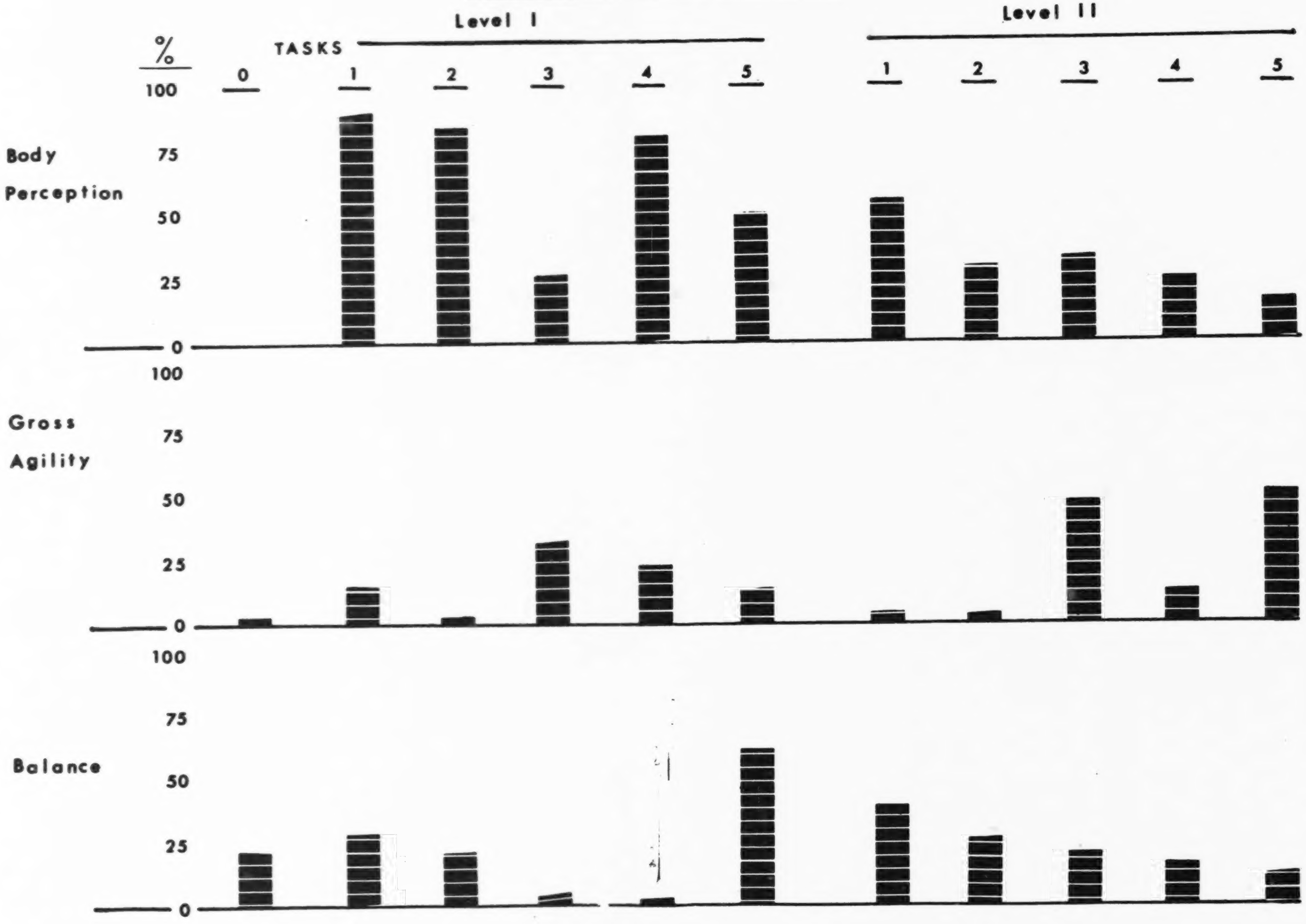
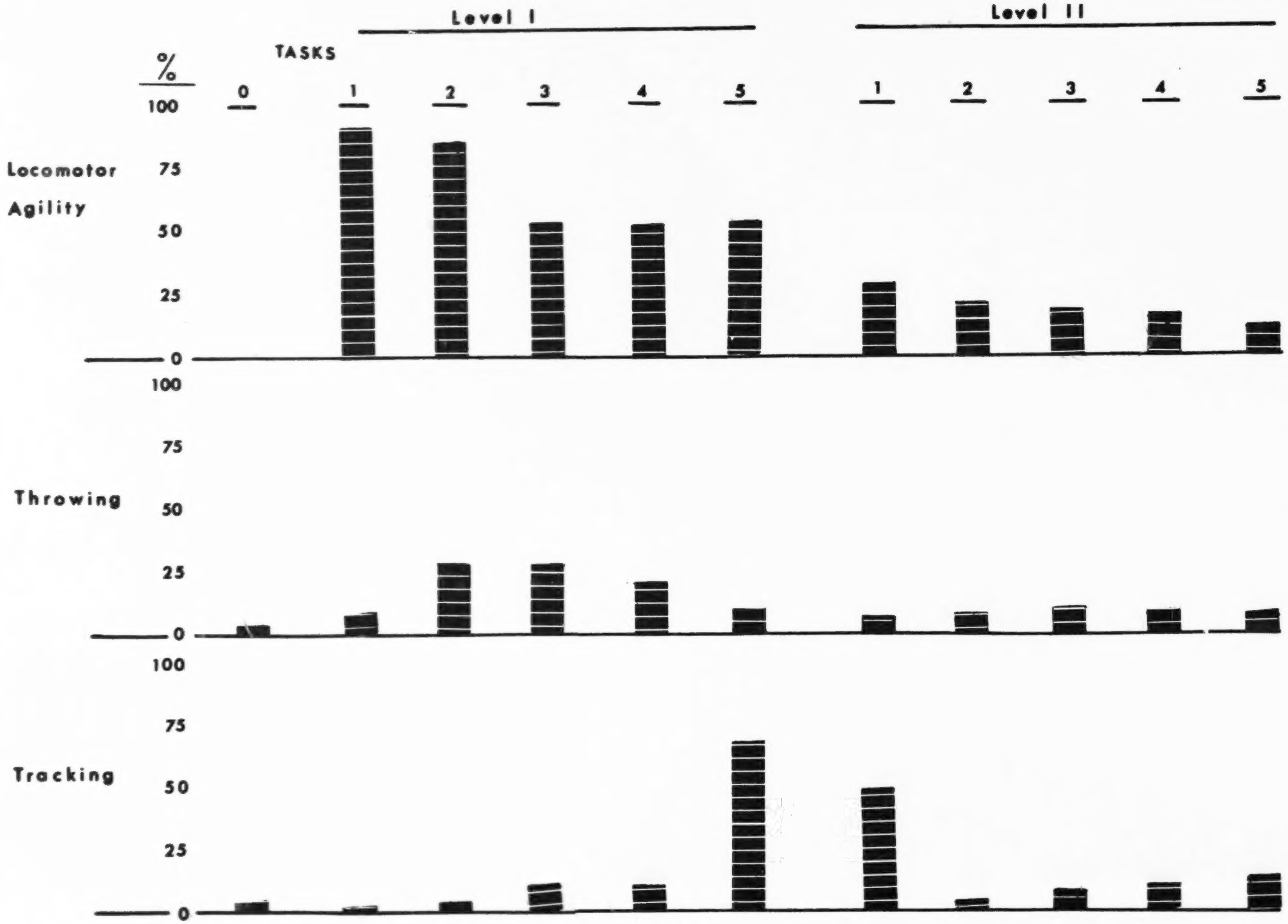


Table X Continued

Percent of Total Subjects Successfully Performing

Tasks Within Six Categories



Trainable Mentally Retarded: (TMR). 113 of the subject population were classified as Trainable Mentally Retarded (TMR). The average age of this group was 12.37 years, with a range of from three years to twenty-two years. Sixty-four per-cent of the TMR's were boys (73 subjects) and 22.1% were Negro. Thirty-six (31.8%)of the TMR's evidenced characteristics described as Down's Syndrome (Monogoloid). The latter sub-groups' scores are analyzed separately in section which follows this one.

Reference to Table XI indicates that as a group the TMR's were inferior in performance averages to the mean scores achieved by EMR's and the Educationally Handicapped children who were tested. Similar to the analysis presented in Phase I of the investigation, these differences were significant in all of the tests and when contrasting total test battery means.

A more detailed analysis of the tasks in which these differences were more apparent (Table XII - XVII) indicate that the tasks within the second levels in the Body-Perception category, and the Locomotor Agility category were seldom accomplished by the TMR. For example, only about 20% of the TMR's were able to correctly identify left and right arms and legs (Table XII) when requested, whereas over 50% of the EMR's were able to do so. Similarly only about 5%

Table XI

Inter-Group Comparison of Mean Scores In Six Test Categories

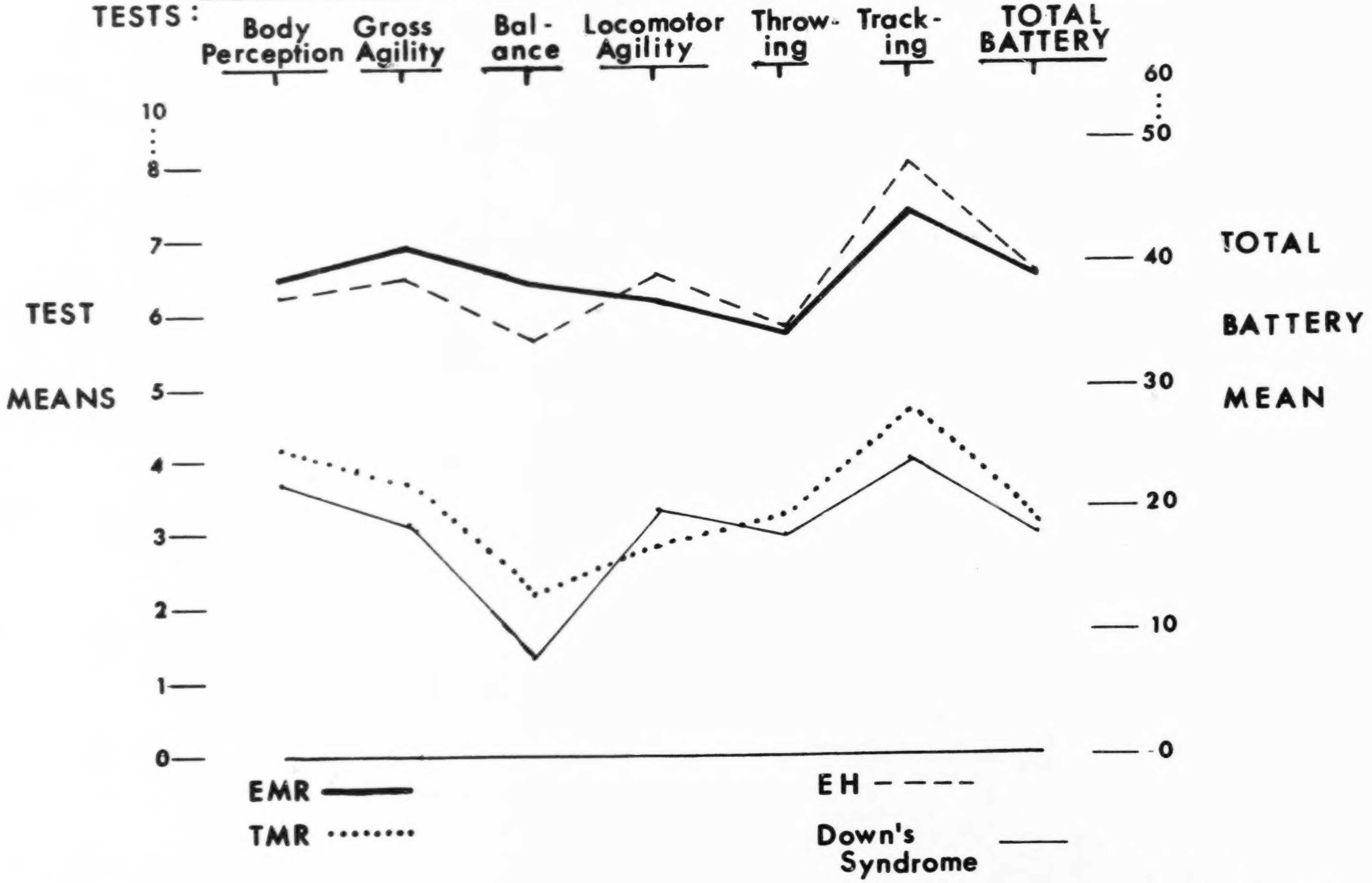


Table XII

Inter-Group Comparisons of Percent of Subjects Successfully Performing Tasks in Body Perception

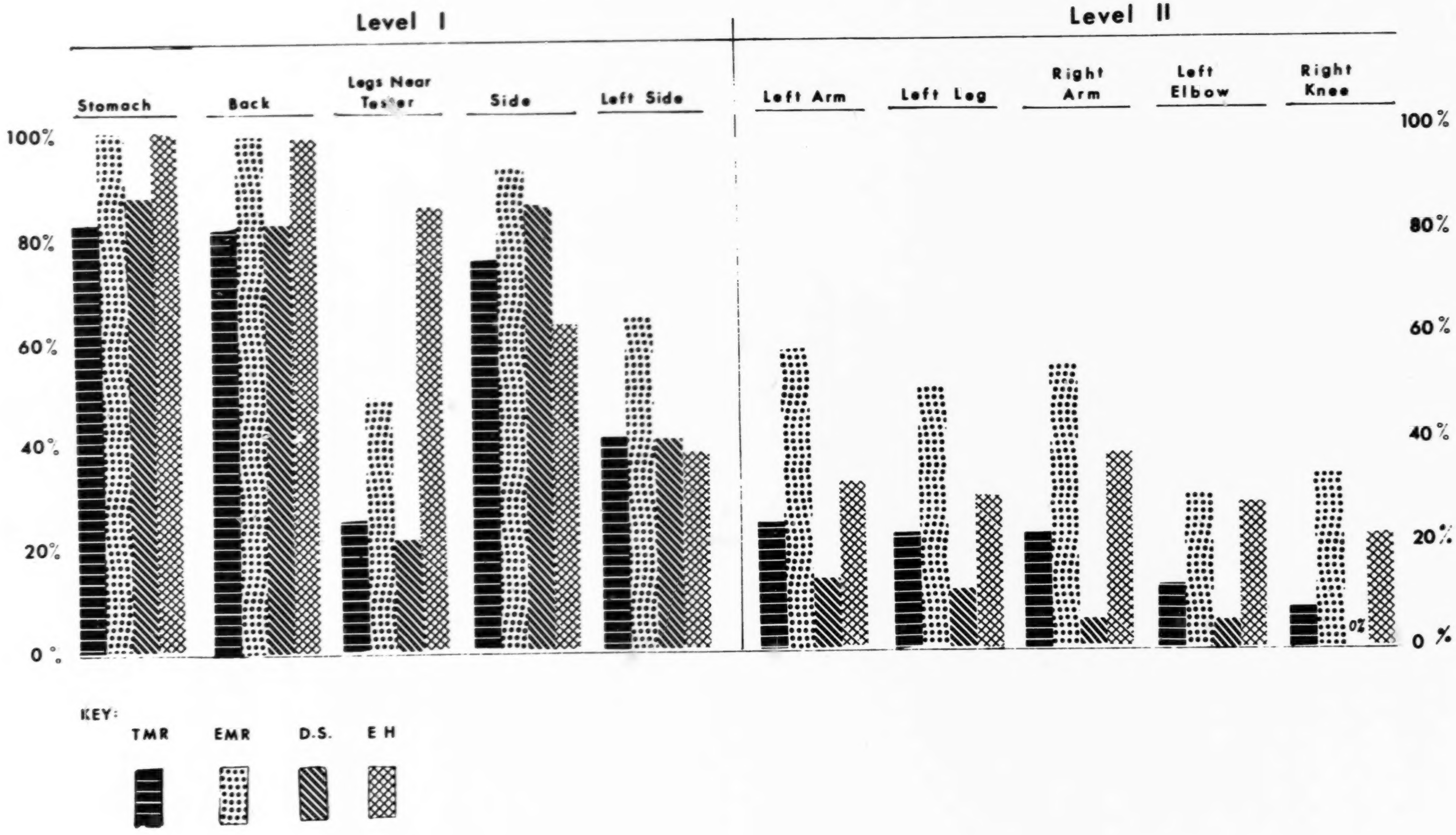


TABLE XIII

PERCENT OF SUBJECTS IN SELECTED GROUPS SUCCESSFULLY PERFORMING AT VARIOUS LEVELS IN GROSS AGILITY CATEGORY

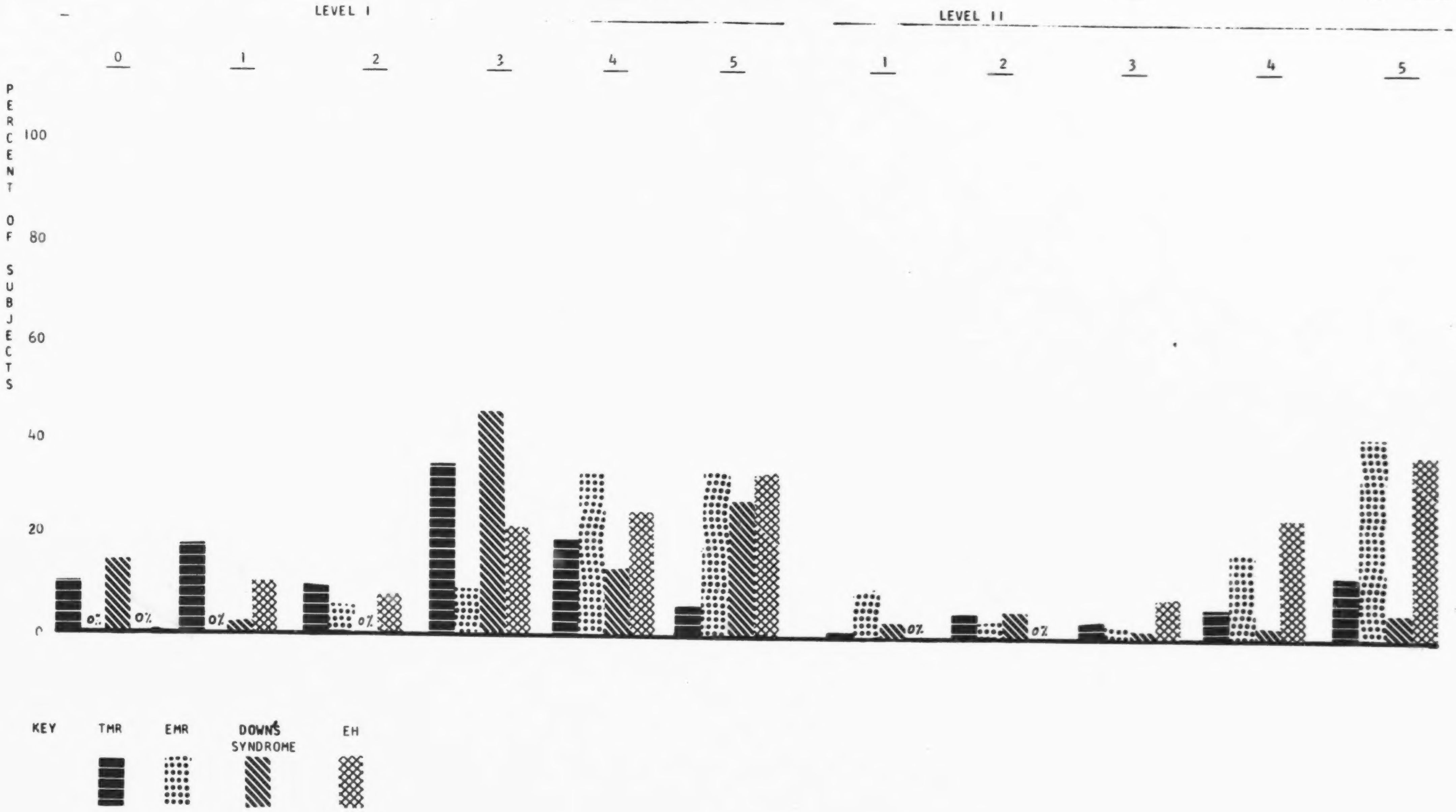


TABLE XIV

PERCENT OF SUBJECTS IN SELECTED GROUPS PERFORMING AT VARIOUS LEVELS IN BALANCE CATEGORY

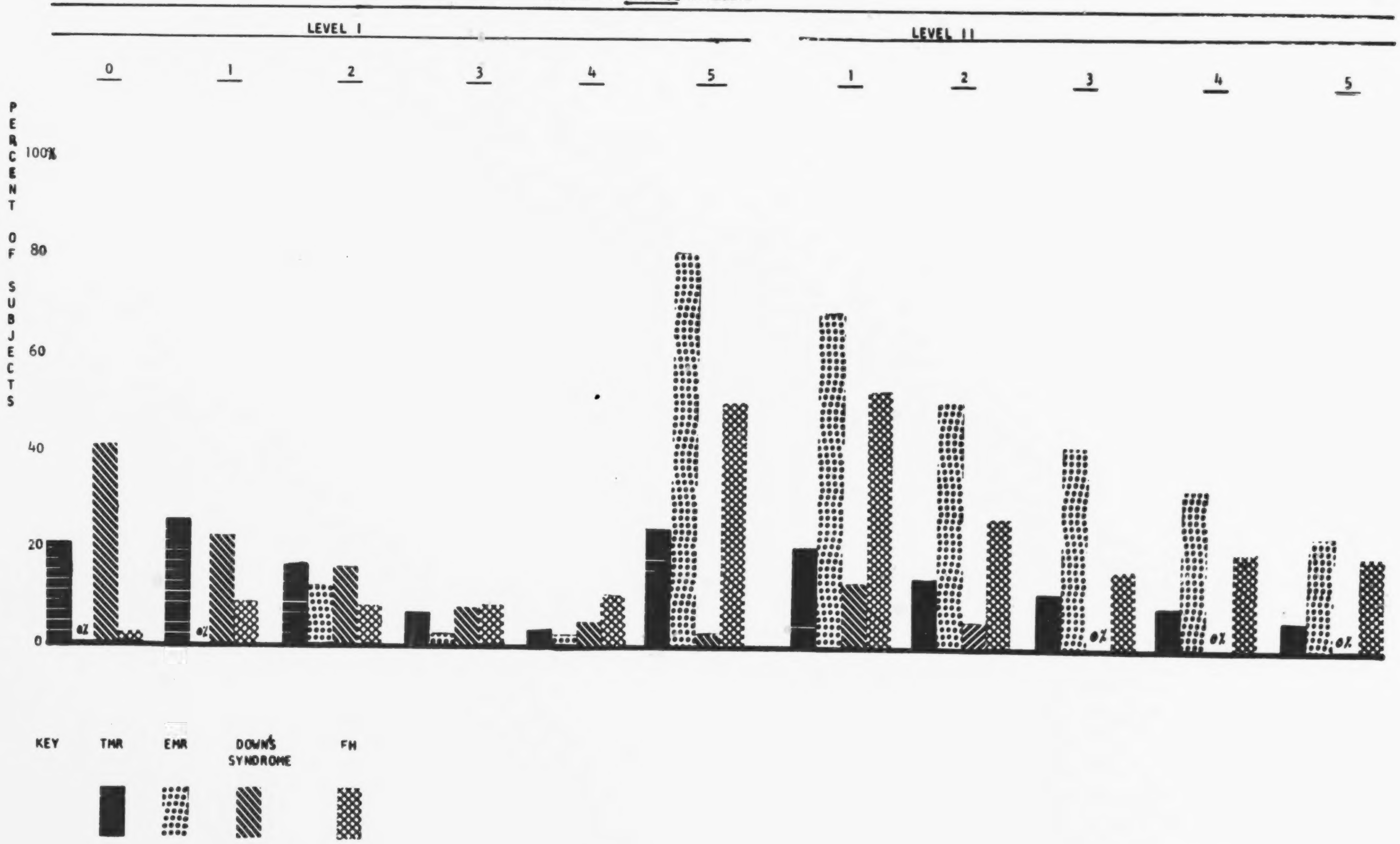


TABLE XV

INTER-GROUP COMPARISONS OF PERCENT OF SUBJECTS SUCCESSFULLY PERFORMING TASKS IN LOCOMOTOR-AGILITY CATEGORY

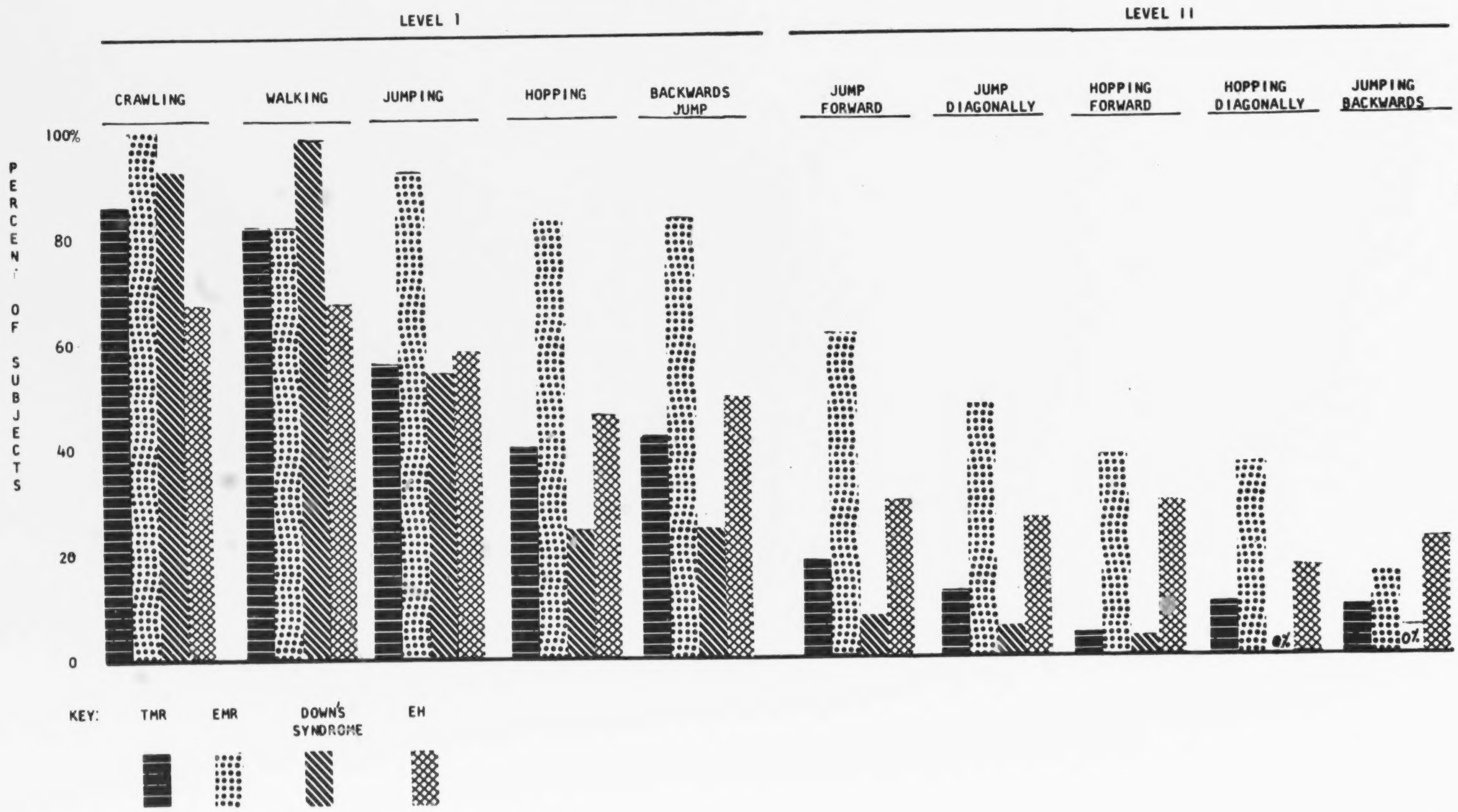


TABLE XVI

PERCENT OF SUBJECTS IN SELECTED GROUPS PERFORMING AT VARIOUS

LEVELS IN THROWING CATEGORY

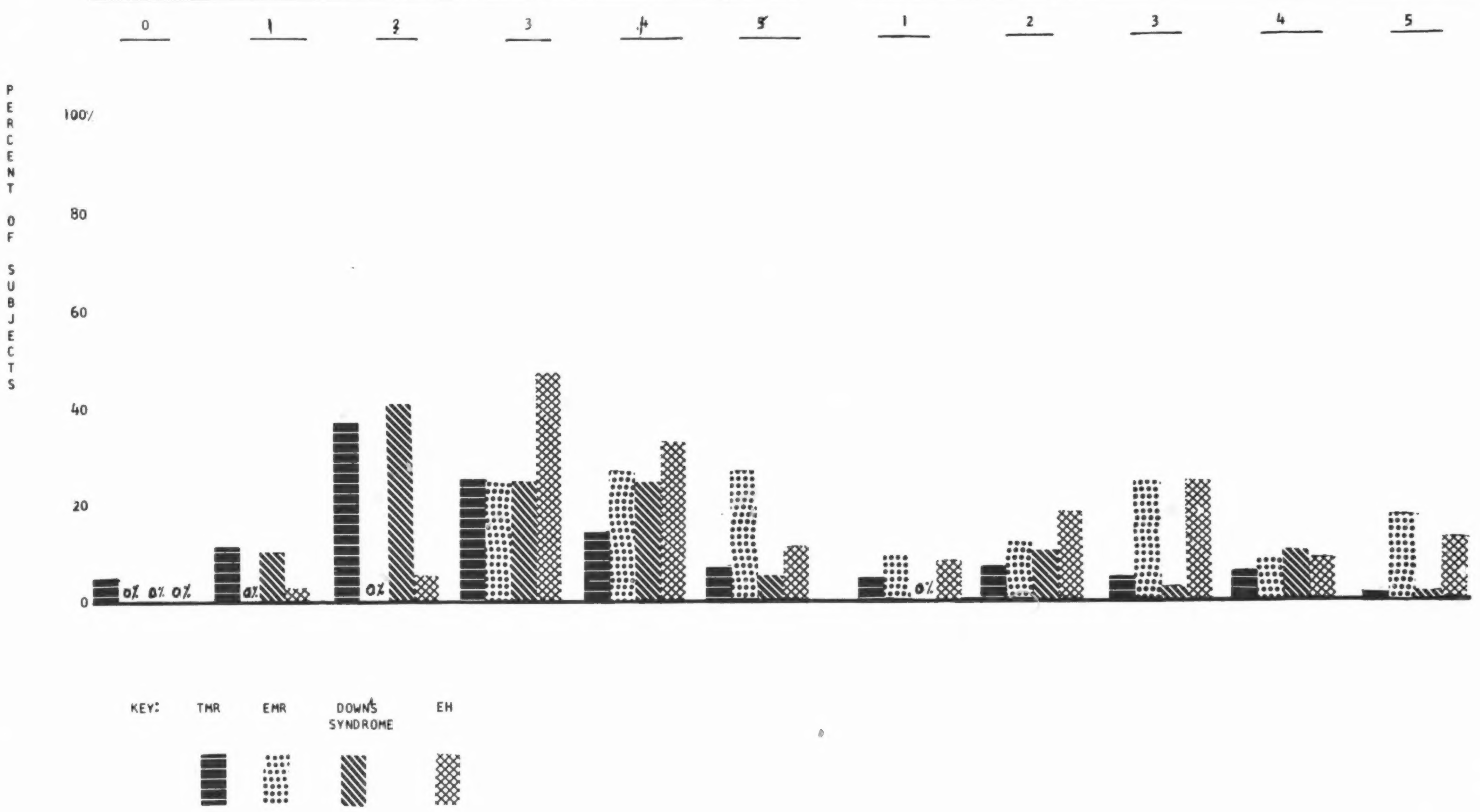
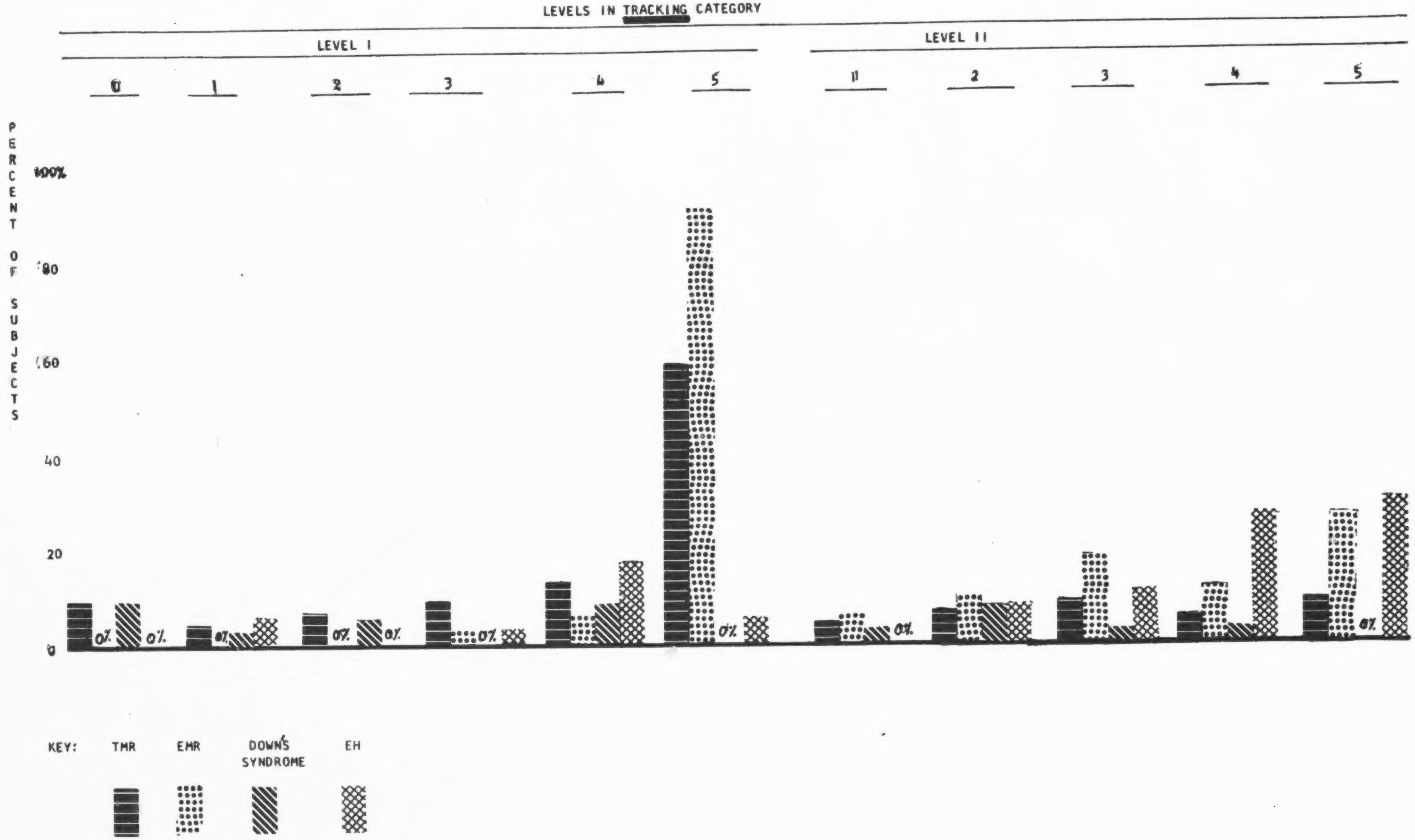


TABLE XVII

PERCENT OF SUBJECTS IN SELECTED GROUPS PERFORMING AT VARIOUS LEVELS IN TRACKING CATEGORY



of the TMR's were able to hop, and jump accurately on the "checkerboard" mat, whereas about 40% of the EMR's were able to do so. (Table XV)

Reference to Table XIV describing the percent of subjects able to perform various tasks within the Balance category also points to reasons for the significantly different mean scores achieved by the EMR's and TMR's. 81.8% of the EMR's were able to balance on one foot for over five seconds, with their arms folded across their chests, whereas only 24.7% of the TMR's were able to do so.

Table XVIII, and XIX graphically describe developmental trends in the abilities of the TMR group. In general these data indicate that although the most marked improvement in scores are in the Tracking category, Significant differences are found, for example between the mean scores of the TMR's 9-10 years of age, and TMR's 17-20 years of age in ability to catch a ball bounced to them and in the ability to anticipate the pathway of a ball and to touch a ball swung on a string. The most marked improvement in balance on the part of the TMR's occurs between the sixth year and the 9th year means; balancing ability tends to plateau after the age of ten years of age. The ability to balance in normal children also tends to plateau earlier than other attributes, at about the age of thirteen. In general the mean scores for the total battery for the TMR's between the ages of five to eight years are quite similar. While the best performance on the part of the TMR's appears within the sub-population from seventeen to twenty-four years of age. Mean scores for children from nine to twelve years of age are intermediate to those of the previous two categories mentioned. (Tables XVIII, and XIX) Norms, by age for the TMR category are found in the Appendix.

Downs' Syndrome. This sub-category of the TMR population ranged in age from six to twnety-four, with a mean of 12.78 years. 67.5% of the Monogoloid children were boys; and similar to the analysis of this sub-population presented in the initial section of this chapter, they were motorically the most inferior group of those compared. (Table XI) They had the most difficulty when balancing in Tracking tasks, and when performing locomotor skills involving the coordination of foot-eye movements in the second level tests in the Locomotor-Agility category.

A survey of Tables XII to XVII reveals some of the specific tasks in which the Monogoloid children evidence difficulty. Only four out of the thirty-seven children had any concept of their left-right hands, and the differences. (29.7%). Forty per-cent were unable to posture on one leg for more than two seconds! While only about two subjects in this

TABLE XVIII

MEAN SCORES OF TMR CHILDREN (5-12 YEARS) IN SIX TEST CATEGORIES AND IN TOTAL BATTERY

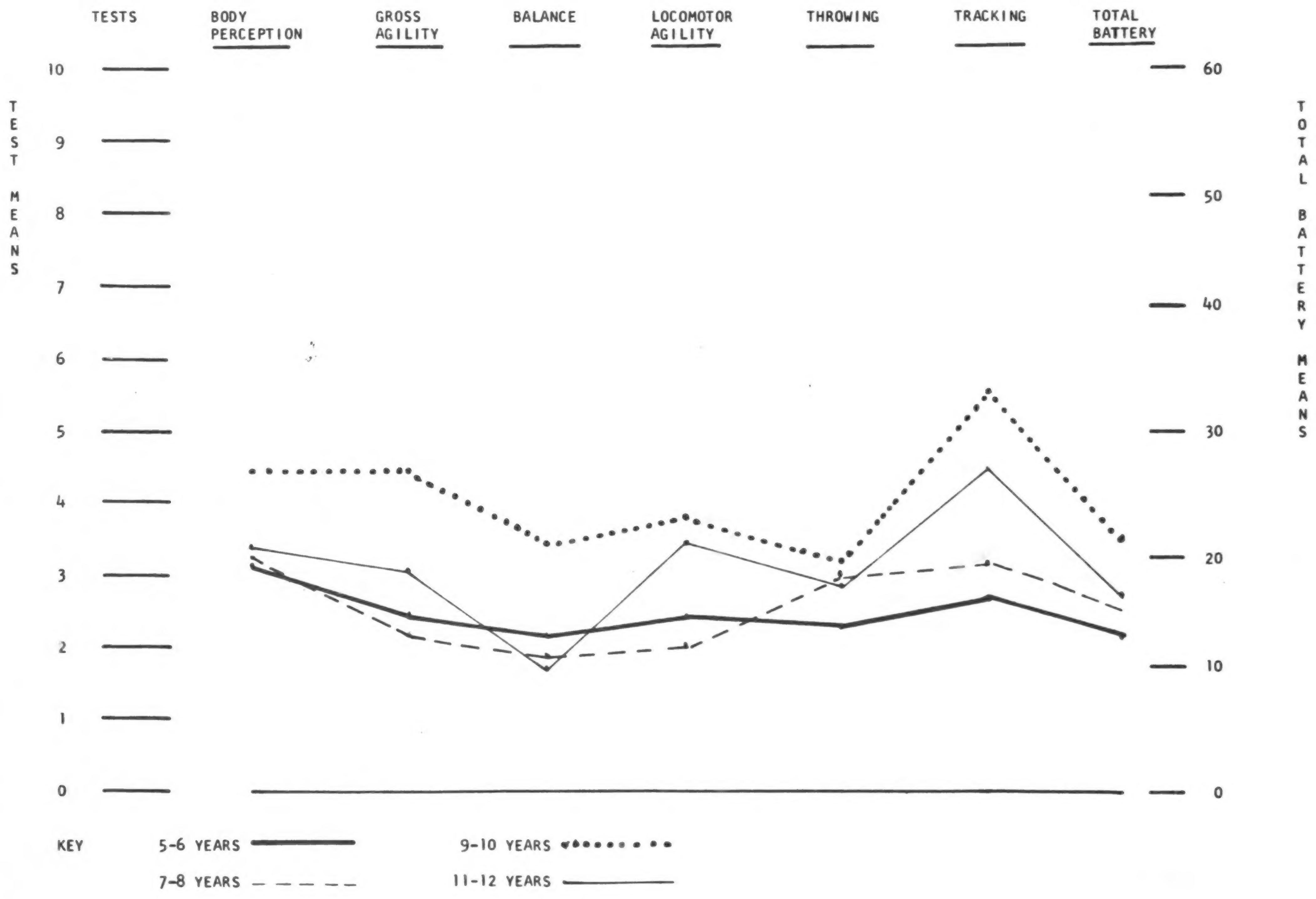
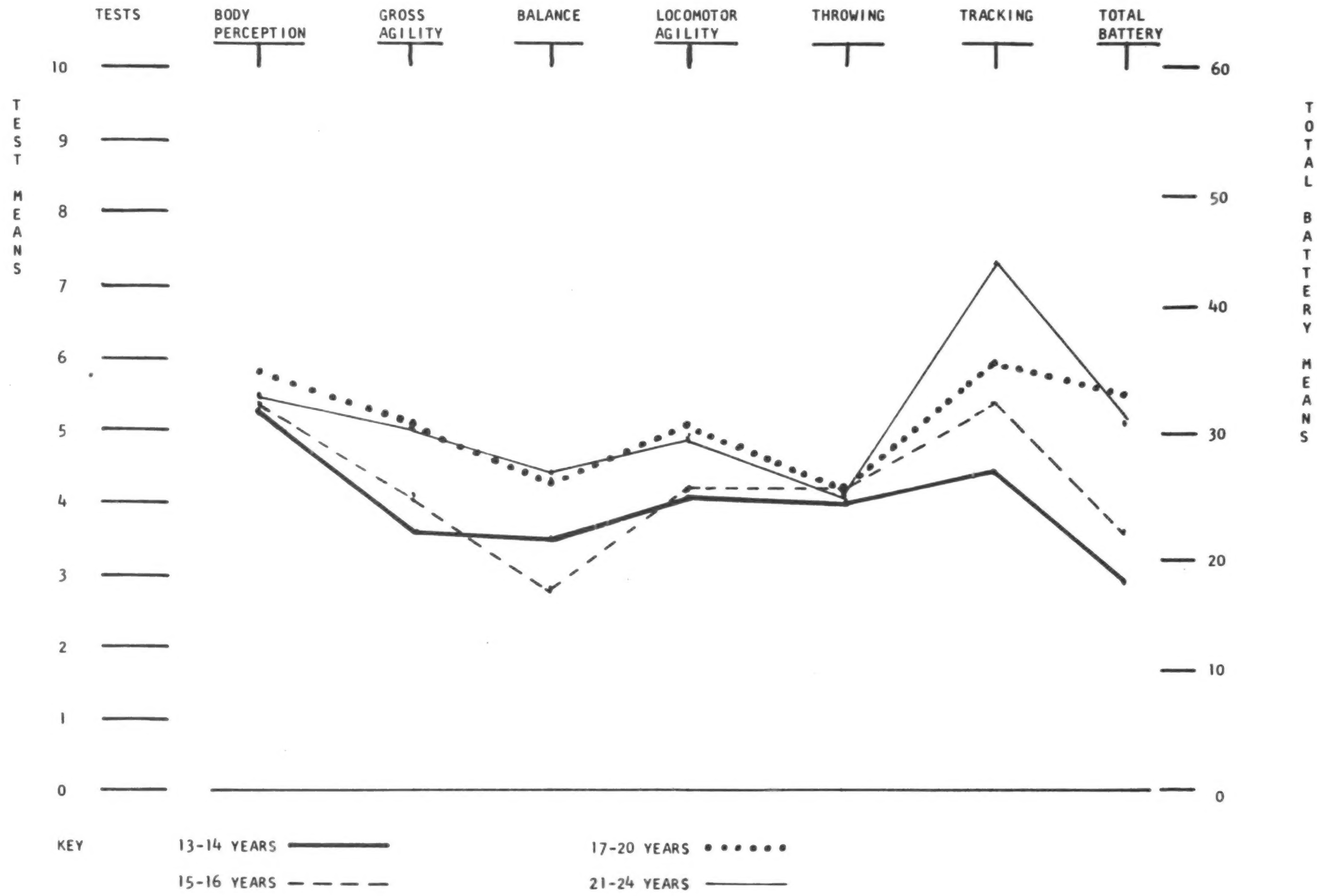


TABLE XIX

MEAN SCORES OF TMR's, ADOLESCENTS (13-24 YEARS OLD) IN SIX TEST CATEGORIES AND IN TOTAL BATTERY



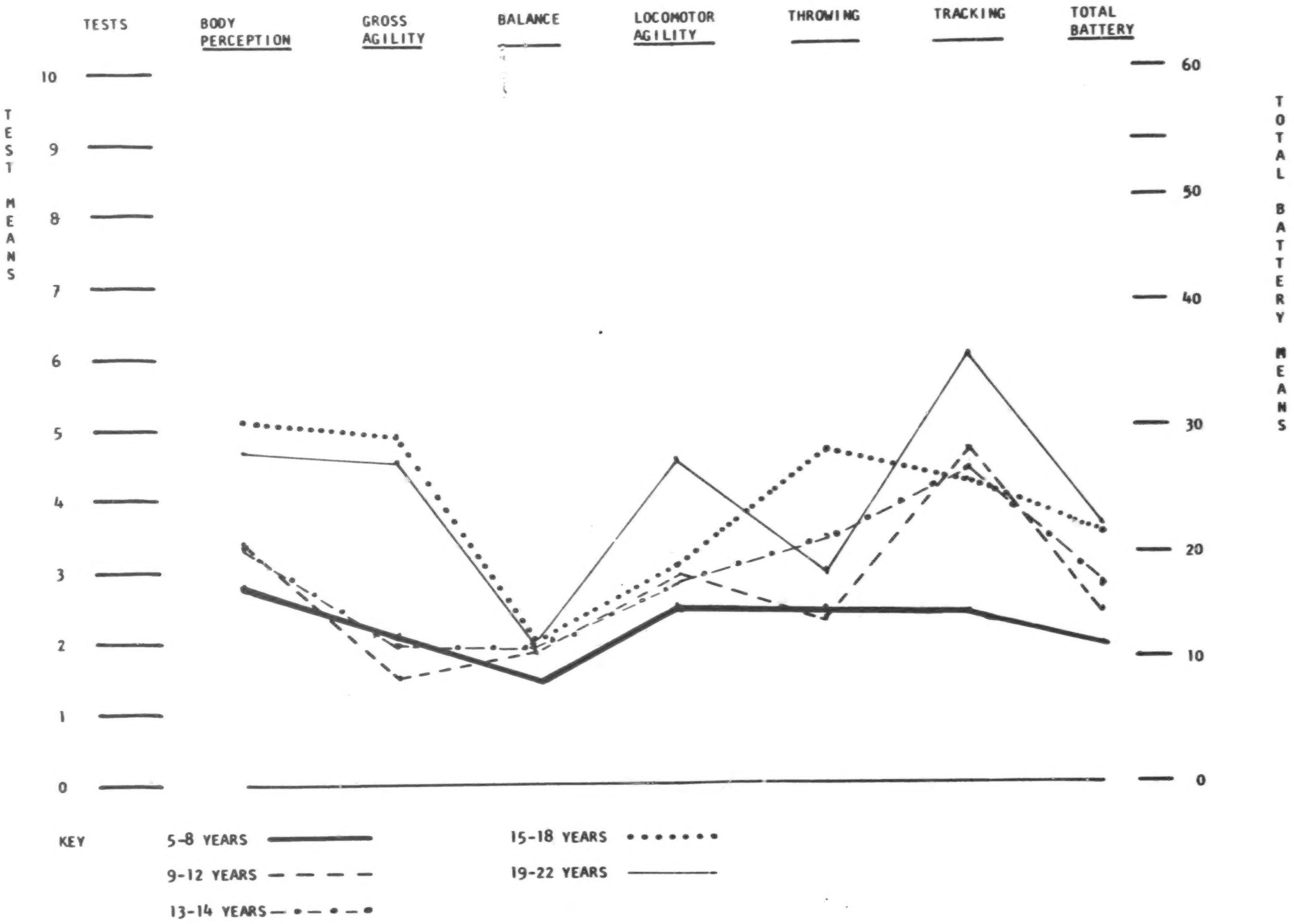
category were able to evidence any ability at all in jumping and hopping accurately in the checkered mat! Eighty-six per-cent of the children manifesting Down's Syndrome were unable once to touch a ball swung in front of them, given five trials of three swings each. Only about one-half were able to hop or jump off the ground three times in succession. The typical throwing pattern for the Monogoloid was a two-handed over-head effort, usually seen in normal children of two years. Only about 13% evidenced any ability when attempting to throw accurately at the mat containing the target 2' by 2' square placed 17' away.

Not until the age of about 15 (Table XX) does the Monogoloid child evidence on the average the ability to accurately place himself relative to an object, or to consistently copy demonstrations of gross bodily movements. The balancing ability of Monogoloids does not improve significantly with age, according to this data; significant improvement in Locomotor Ability is not evidenced when the scores of the Monogoloids five to eight years of age are compared to those achieved by children over the age of nineteen years (t=2.03, not significant at 5% level).

The most marked improvement in capacities of the Monogoloid is evidenced in the Tracking category, from a mean of about two at the age of five to eight years of age, (i.e.

TABLE XX

MEAN SCORES OF D.S.'s, BY AGE, IN SIX TEST CATEGORIES AND IN TOTAL BATTERY



catches a large ball bounced to him two out of five times) to a mean score of six achieved by late adolescents and young adults. (indicating the ability to catch five out of five, and to touch a swinging ball once out of five times) (Table XX) (p=.01) .

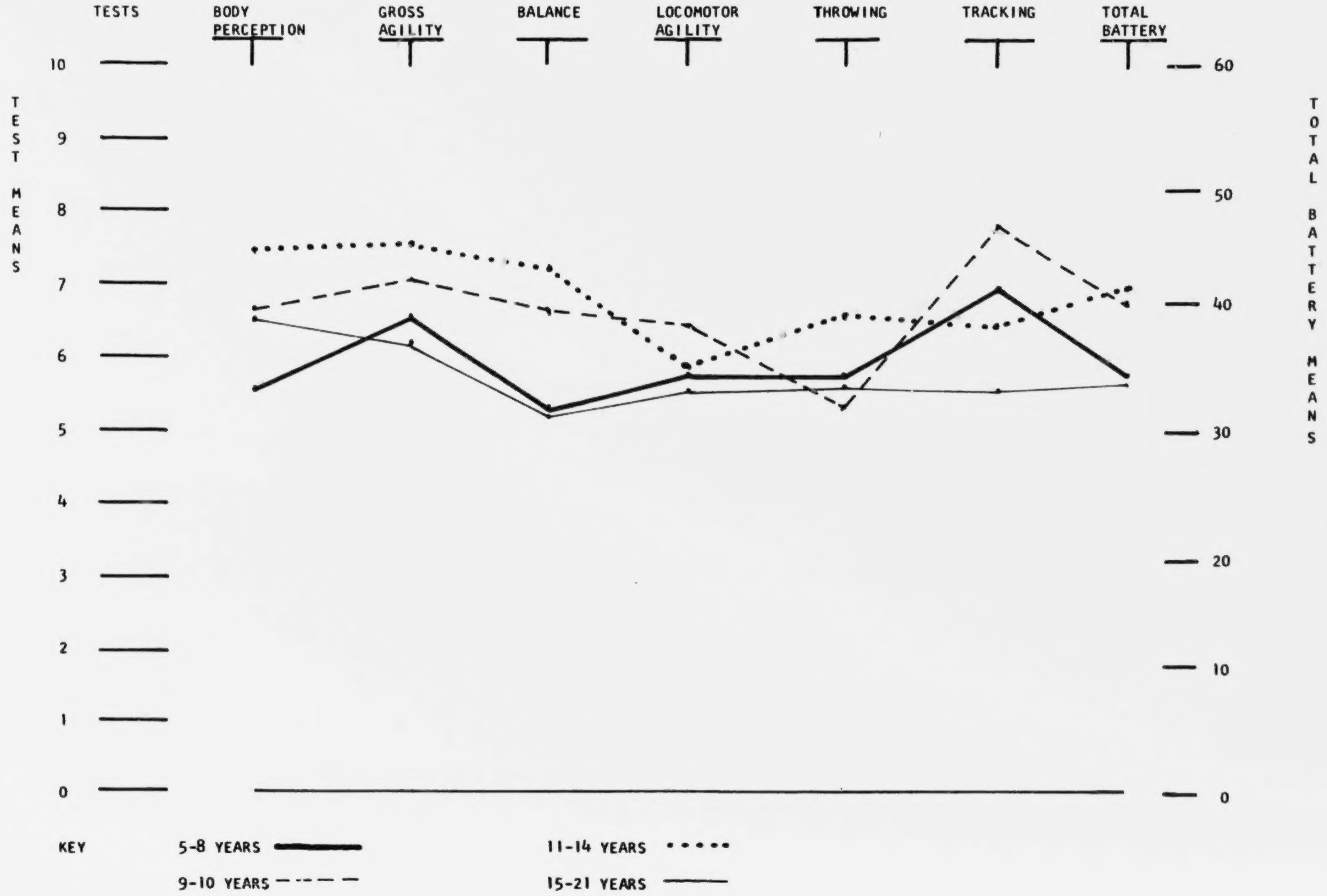
Similarly improvement was evidenced by children with Down's Syndrome in the tests evaluating Gross Agility, and tasks purporting to evaluate Body-Perception. Improvement in the former category occured most markedly when the scores of the children between nine and twelve years of age were contrasted to the scores of the children between fifteen and eighteen years of age. (p=.01) In the Body-Perception task improvement was most significant when the mean score of children from five to eight years of age and the mean score of children fifteen to eighteen years of age were compared (p=.01) The most significant improvement was evidenced in the total battery mean when scores of children five to eight years of age were contrasted to the mean score achieved by young adults from nineteen to twenty-two years of age (p=.05).

Educable Mentally Retarded. The thirty-eight subjects classified as Educable Mentally Retarded, scored between fifty and seventy in I.Q. tests, and in general evidenced no severe or mild neuromotor problems. As is true within

2

TABLE XXI

MEAN SCORES OF EMR's, BY AGE, IN TEST CATEGORIES AND IN TOTAL BATTERY



the other categories the majority of the EMR's were male (72.7%) and Caucasian (81.8%). None of the EMR's evidenced Down's Syndrome, and their average age was 10.80 years, with a range of five to twenty-three years.

As a group the EMR's were superior to the other sub-classifications (Table XI) previously discussed, and similar in ability to the Educationally Handicapped children. Their scores averaged near the middle of the ten point scale in each category.

A survey of Tables XII to XVII reveals the following; all of the EMR's were able to "place their legs nearest me" when requested to do so by the tester. Even this superior group, however, evidenced the inability to correctly identify their left and right arms and legs better than might be expected by chance (range in percentages was 57.5% to 33.3% of the subjects correctly responding to directions requesting them to "raise your left arm, etc.")

Most of the EMR's (81.8%) evidenced fair balance ability and were able to balance on one foot for more than six seconds. Over two-thirds of the EMR's were able to posture on one leg, arms-folded for more than five seconds. (Table XIV) Over one-half of the EMR's were able to arise to a standing position from their back in about two seconds; and similarly were able to perform correctly the four-count agility movement required in the second level of "Gross Agility."

Between 80 and 100% of the EMR's displayed an appropriate cross-extension pattern when crawling, and walking; and additionally were able to hop and to jump both forward and backward (Table XV). Between 50 and 60% were able to jump in the squared mat accurately, while only about 40% were able to hop on one foot with precision. Particularly difficulty was noted, on the part of the EMR's when asked to jump backwards, and only five subjects within this category were able to complete the most difficult task within the second level of the "Locomotor Agility" category (i.e. jumping backwards in squares).

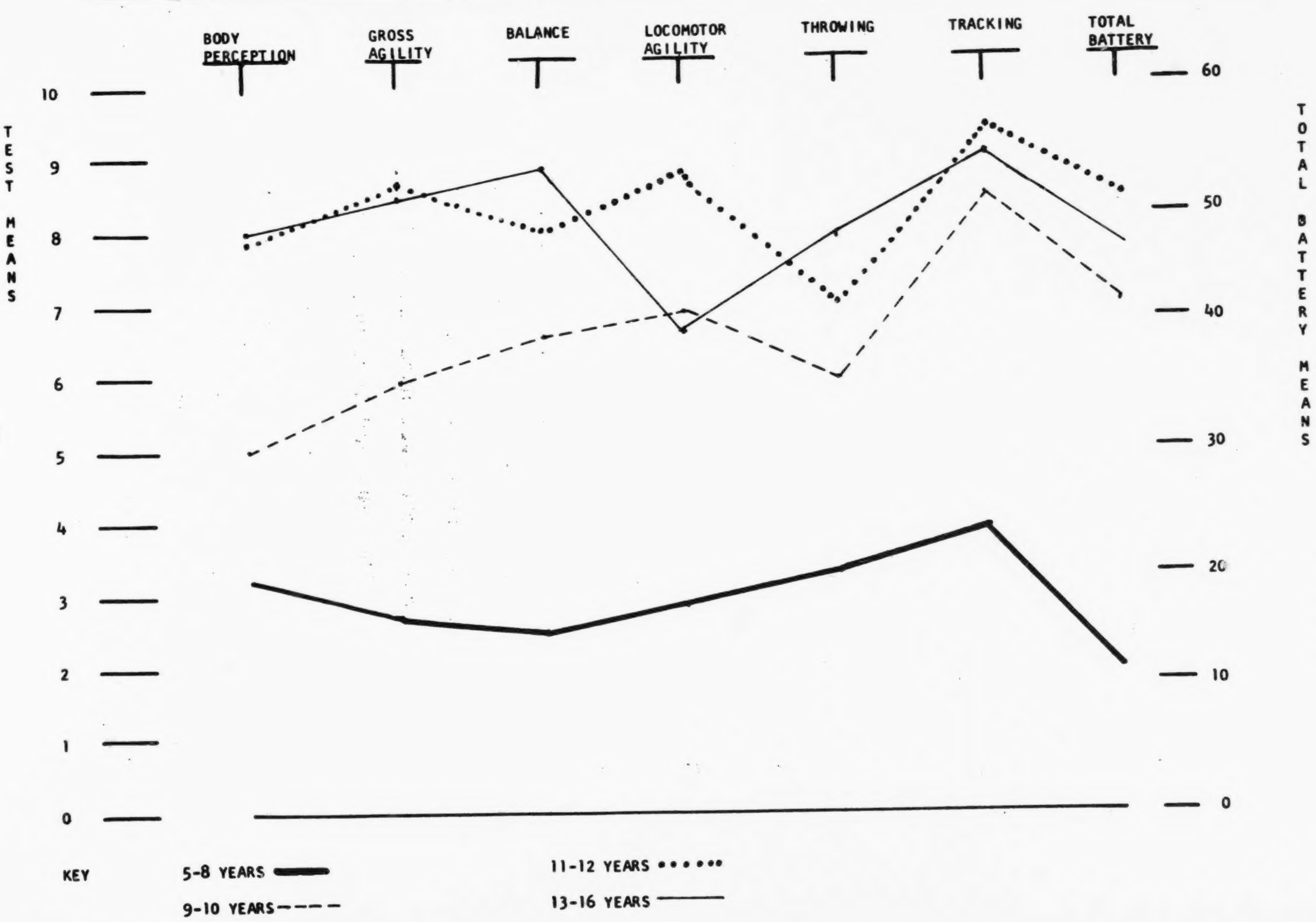
About 90% of the EMR's were able to catch an 8 1/2" ball bounced to them five out of five times as the tester stood ten feet away. About 60% were able to touch the ball swung on the string three out of five times. The typical throwing pattern evidenced by the EMR was a one-handed throw without the proper weight shift. Only about 27% of the EMR's evidenced an appropriate weight shift and step when throwing with one hand. The proper weight shift is usually noted in normal children about the age of six years. The majority of the EMR's were able to hit a 2" x 2" target placed on a mat seventeen feet away with a playground ball 8 1/2 inches in diameter on three out of five trials.

Developmentally the EMR seems to reach his peak in performance sometime between the ages of nine and fourteen years. After these ages some tendency to evidence slightly inferior performance is noted. (Table XXI) Comparison of the mean scores of children five to eight years and the mean scores of late adolescents, within this category indicates a marked similarity---while similar superior scores are noted when contrasting the scores of children from nine to fourteen years. Implications of this finding for programs for the EMR, are discussed in the chapter which follows.

Educationally Handicapped. The thirty-eight subjects in the category named "Educationally Handicapped," are children with learning problems and I.Q.'s from seventy to seventy-five to slightly above normal. Generally these children evidence mild to moderate perceptual-motor impairments and have difficulty spelling, reading and at times writing. The children tested were in special classes to rectify their educational deficiencies. As is true within the other categories the majority of this group are boys (67.5%). Their perceptual-motor profile (Table XI) based upon their mean scores in the various categories closely approximates that of the mean scores of the EMR's and the EH's. The EH's are significantly superior to the TMR's and to children with Down's Syndrome in all of the categories tested. The mean

TABLE XXII

MEAN SCORES OF EH's, BY AGE, IN SIX TEST CATEGORIES AND IN TOTAL BATTERY



age of the EH's is 10.06 years and they ranged in age from five to fifteen years, (the youngest group surveyed).

Analyses of the percent of EH's successfully performing various of the tasks within the six categories (Tables XII to XVII) revealed the following: Although all the EH's were able to make gross judgments relative to their body (i.e. front and back), only about one-third were able to correctly identify its left-right dimensions. Particular difficulty was noted when they were asked to cross their body (i.e. "touch your left elbow with right hand"). Only about 25% of these subjects were able to accomplish these latter tasks successfully. Within the "Balance" and "Gross Agility" categories, about one-half of the EH's evidenced moderate problems, while about 50% did not. (Table XIII)

The children classified as Educationally Handicapped were inferior to all other sub-groups of subjects in the tasks comprising the first level of Locomotor Agility. Only about two-thirds evidenced appropriate cross-extension patterning of the arms and legs when asked to walk and to crawl. Similarly only 50% could hop three times on one foot, and jump backwards. More difficulties were encountered by this group when they were asked to hop and jump accurately in squares. Less than 30% could hop and jump diagonally in squares. Developmentally the Educationally

Handicapped children evidenced improvement with age seen in similar profiles graphed using the scores of normal children up to the age of about twelve (however their mean scores are probably inferior). After the age of twelve, however, there is a slight (but not statistically significant) drop in performance similar to the retrogression seen in the profile of the EMR's previously presented. (Table XXII)

Sex, and Racial Differences: When the mean scores of the Negro subjects were contrasted to the mean scores of the Caucasian subjects no significant differences were found between any of the test scores nor between the mean score for the total battery of the two groups. Similarly no significant differences were found when the scores of the boys and girls were contrasted, using the total subject population. While perhaps more detailed analyses would reveal significant racial or sex differences between various segments of the subject population, i.e. sex differences would be more expected between the teen-age retarded, time did not permit more detailed comparisons to be made.

SUMMARY OF THE RESULTS

1. The test-re-test scores in the individual categories, and in the total battery revealed the battery utilized to be a reliable one (r=+.92).

2. The sub-categories of subjects classified as EMR's and Educationally Handicapped achieved significantly superior scores in all tests and in mean scores for the total battery to the subjects classified as Trainable Mentally Retarded.

3. Most inferior motorically was the sub-classification within the TMR category, composed of children evidencing Down's Syndrome. Particularly difficulty was noted by this group in tasks involving laterality, balance, and in skills involving the pairing of movement with vision (i.e. hopping accurately in squares were scored).

4. The Educationally Handicapped children evidenced the poorer crawling and walking pattern than the EMR's, failing to correctly coordinate arms and legs in appropriate cross-extension patterns.

5. The majority of the subjects in all categories were males (about 67%).

6. Correlation matrixes statistically protraying inter-test relationships indicated that the most severely retarded

evidenced the most generality of perceptual-motor functioning, i.e. there were higher inter-correlations between scores on the part of the TMR's than between the scores on the various tasks by the EMR's.

7. The score most predictive of the total battery score, by the part of the TMR's was their achievement in the Body-Perception category (r=.90).

8. The score of the Balance category was most predictive of the total battery scores of the EMR's (r=.84).

9. Developmentally the EMR's and the Educationally Handicapped children evidenced the best functioning during late childhood and early adolescence, with some deterioration noted in their mean performance scores in late adolescence and early adulthood.

10. The children with Down's Syndrome, evidenced continual improvement in the scores achieved in the total battery with increased age, scores achieved in the Throwing category were superior in the sub-category of Monogoloids between the ages of fifteen and eighteen.

11. The Balance scores of the Monogoloid children remained relatively fixed despite increasing age. Significant changes, with age, on the part of the children with Down's Syndrome occurred in the scores reflecting tracking ability, in gross agility, and in body-part perception.

12. The majority of the subjects in all categories evidenced difficulty when attempting to correctly make left-right identifications relative to their bodies. Despite the mean age of the population, of 11.4 years (no sub-category of subjects had a mean age below 10.0 years), no group consistently evidenced the ability to correctly identify their left and right hands and legs better than would be expected by chance.

13. Most marked differences between scores achieved by TMR's and EMR's occured when vision and movement were paired in various tasks including jumping in squares, touching a swinging ball, etc.

14. A correlation computed between I.Q. and score in the total test battery reached an r of +63. The I.Q.'s on thirty-seven subjects were available for this comparison.

15. Age when correlated with the total battery score reached an r of +.54, based upon the scores of eighty-three subjects.

16. No significant differences were found between any of the scores achieved by the Negro and Caucasians subjects, nor between the scores recorded by the girls and those of the boys.

CHAPTER IV
DISCUSSION OF THE FINDINGS, AND IMPLICATIONS FOR PROGRAMS FOR RETARDED YOUTH

The influences of various types of programs upon the improvement of the perceptual-motor abilities of retarded youth are little understood. An extension of this investigation will involve the exploration of the long-term effects of various training procedures upon perceptual-motor functioning of children with mild to severe learning deficiencies. At the same time it is believed that the findings on the preceding pages do hold important implications for individuals planning programs of education, recreation and physical education for retarded children and adolescents.

In the statements which follow it has been attempted not to "stray" too far from the data. The chapter is organized initially into a section containing a general discussion of some of the basic information contained in the findings. Following this,sections are written which outline training procedures it is believed might be helpful to the four sub-categories of subjects studied in this investigation.

GENERAL DISCUSSION

It is believed that one of the most helpful findings is that if proper tools are constructed, the perceptual-motor abilities of retarded children may be reliably evaluated. At the same time it is realized that such mediating factors as verbal comprehension, and the ability to perceive a demonstration offered by the tester probably influenced the scores elicited from the subjects. The correlation of +.63 between I.Q. and the mean scores of the test battery reflects the extent to which movement accuracy and cognition are inseparable in the retarded. The data from studies of normal subjects seldom demonstrate such close relationships between I.Q. and motor ability.

The increase in correlation coefficients between tests taken by the TMR's versus the relationships demonstrated between the test scores of the EMR's also holds important theoretical and practical implications. The EMRs' seemed more specific in their functioning, i.e. one is less able to predict their score on one test upon knowing how they perform on another, than is the case when surveying the perceptual-motor ability of the more severely retarded children. One might therefore assume that programs for the EMR should include more types of activities, than should programs for the more severely retarded TMR.

Developmentally interesting trends were seen in the data. The apparent peaking of performance in the TMR and EMR during late childhood and early adolescence, and then the subsequent decline in ability might be attributed to a general disinclination on the part of these children to participate, after discovering their ineptitudes during their childhood. With decreased inclination to participate comes decreased capacity to perform. The years during which superior performance is usually noted in normal youth is at about the age of fifteen years for girls and about eighteen for boys, far later in life than the years in which the best scores were noted on the part of the retarded population surveyed.

The emphasis placed upon engaging in basic locomotor tasks (i.e. creeping, crawling) seen in some programs for the retarded would appear to be misplaced. All but a small percent of the EMR's and TMR's as well as the children with Down's Syndrome were able to evidence good cross-extension patterns when crawling. Only the children with Educational Handicaps (i.e. mild to moderate neuromotor impairment) seemed to have difficulty when crawling, and even in this latter group this inability was evidenced by only about one-third of the subjects.

More important it would seem, upon inspecting these data, would be to present tasks in which the retarded are required to coordinate arms and legs in more complex tasks, and particularly helpful, it would appear, are tasks in which arm-leg and bodily movements must be visually controlled and monitored.

Upon viewing the data collected in the Body-Perception category it would appear that another section of the battery containing tasks similar to that which required that the child relate himself spatially to the tester (i.e. lie with your feet nearest me) be included. In general only about 50% of the retarded youth were successful in this sub-task. Such a testing category and group of training activities which are probably more difficult should follow basic training in body-part identification. They should be engaged in prior to, or in conjunction with, basic training in left-right discrimination.

Several interesting facets of behavior, not appearing in the statistical tables, were noted by the testers during the course of the investigation. Several subjects, for example, posted better scores when asked to hop on one foot than when they attempted to jump on both feet at the same time! These children, usually evidencing some type of asymetrical neuromotor involvement, performed better when they could lift their "bad" leg from the floor and hop on one foot, then when required to drag the less proficient limb with them.

Another interesting observation was that several children,usually the more severely retarded, seemed unable to close their eyes and to perform the tasks required of them without vision (i.e. Body Part Identification Level II and Balance Level II). Closing their eyes seemed to constitute a difficult coordination for them, particularly when attempting simultaneously to perform another motor act. This inability was not apparently influenced by anxiety in the testing situation.

Another intriguing finding was the close relationship between the scores in the Body-Perception category and scores in the total battery on the part of the TMR's. Whether such a relationship merely indicates the importance of verbal ability reflected in both scores, or upon some other mediating influence is difficult to determine. One might, however, assume that the retarded child's ability (or inability)to move effectively is reflected in a poor perception of his vehicle for movement (his body) or conversely that inability to locate body parts accurately produces a similar inability to move effectively. In either case it is apparent that basic training in bodily movement should be preceeded by and/or be accompanied by tasks intended to enhance the individual's perception of his body. The investigators, like many others, believed that perception and motion were closely aligned, however, the high positive correlation obtained (+.90) was unexpected and was re-checked to assure its accuracy.

In future studies it is intended to explore the following questions in more detail:

1. The influence of specific training programs for the retarded upon change in various perceptual-motor attributes, and in I.Q. measures.

2. The relationship between I.Q. scores, social adjustment scores, and perceptual-motor ability on the part of various sub-categories of retardants.

3. Comparisons of the profiles obtained to scores achieved by normals.

4. The relationship of complex versus simple motor tasks to intelligence measures, and the influence of training in tasks requiring varying degrees of visual-motor

integration upon improvement in intellect.

5. The relationships between body-to-object training, body-part training, and motor ability measures.

PERCEPTUAL-MOTOR TRAINING PROGRAMS FOR...

...Children with Down's Syndrome: It would appear from the data that Monogoloid children not only evidence the most severe movement problems, but also their abilities are relatively unaffected as they grow older. At the same time the data indicates that their attributes may change with training, as evidenced by improvement in tasks in which they might have been expected to have practiced, (catching a ball). Their most severe problem seemed to be balance, in tasks indicating an accurate perception of their bodies, and in tasks involving movement with visual control (jumping accurately in marked squares).

It would thus seem reasonable that programs for children with Down's Syndrome should emphasize activities within these three general areas. Care, however, should be taken to present activities at extremely simple levels to these children. For example balance training should probably take place initially with the child on "all-fours" as the data indicates that most of these children were unable to balance in an up-right position with both knees and feet touching the mat. Training in body-to-object location should be undertaken, for example, by placing a box in a room and asking the child to place his front, back, side, left side, etc, nearest the box.

General agility tasks should also be included in a program for the Monogoloid. Their inability to move backwards, and to arise efficiently from a lying to a standing position indicate that falling, tumbling, rolling and other similar movements need considerable practice by this population of children.

...Children Who are Trainable Mentally Retarded: In any group of children classified as Trainable Mentally Retarded one might expect to find from one-third to one-half who manifest Down's Syndrome. Thus the suggestions on the previous pages apply to children within the "Trainable" Category.

At the same time children who are TMR's and who do not evidence Down's Syndrome should be given tasks which lead in a logical way toward activities which are socially acceptable to themselves and to their peers. The decrease in ability indicated in many of the mean scores of this group with increasing age, indicate that motivation (or lack of it) proves important as a modifier of performance on the part of the TMR in late childhood or early adolescence.

Thus a perceptual-motor training program for the TMR should include activities designed to enhance balance, body-part perception, body-to-object perception, agility, as well as ball skills, hop-scotch etc. designed to lead into socially approved playground activities.

As is the case with all groups of retarded children from four to five types of activities within a single forty-five minute to one hour training session would seem desirable. If one were to chose the most important activities for the TMR to engage in they would seem to be practice in body-part perception and in balance. The data indicates that the educator, to be successful, may chose fewer kinds of activities to constitute a program for the TMR than for the EMR. A greater amount of time should be spent with the TMR in practicing these tasks, despite the fewer types of activities which would appear to benefit him.

...The Educable Mentally Retarded: In contrast to a program for the EMR, the TMR requires a wider variety of activities, and activities which are of course more taxing in nature. Their attention span can be expected to be longer than that of the TMR, and they evidence more specific abilities apparently influenced by various kinds of part training to which they have been exposed as individuals.

The single type of activity most important to the total neuromotor development of the EMR appears to be tasks involving balance. Thus tasks involving both dynamic (moving down a balance beam), as well as static posturing would appear to be an important part of a perceptual-motor training program for the EMR.

Additionally training in left-right discrimination relative to body parts should also be included in such a program. Similarly training in correct and accurate agility movements involving arm-leg coordination, paired with vision should be included. Training in throwing at targets, as well as in correct throwing form should also be included. As the majority of the EMR's could not place their legs nearest the tester a portion of an educational program should afford practice in tasks training this important body-to-object attribute. The majority of the EMR's were found unable to accurately cross their body with arm movements, and to locate body parts in this manner. This training in lateral arm movements when drawing on black-boards, coupled with body-part perception training of a more complex nature should be engaged in by the EMR.

...The Educationally Handicapped: This population is being given increased attention by educators throughout the country. Many of these kinds of children are found in classrooms competing unsuccessfully with "Normals", and due to rather subtle perceptual-motor impairment have difficulty organizing their bodies, their movements, and components of the visual world.

The data collected on these children revealed a similar "uneveness" which holds important implications for programs designed to enhance their educational abilities. This is one of the few groups in which a relatively large percent of the members failed to evidence appropriate cross-extension patterns when crawling and walking. Many of these children would probably be classified by the pediatric neurologist as afflicted with slight cerebral palsey or as evidencing minimal brain damage.

Similar to the other sub-populations surveyed they evidenced problems when attempting to make left right discriminations, and when asked to cross their body when identifying body parts. At the same time deficiency in balance and agility were similarly uncovered. This group of children are frequently beset by emotional problems, as they are usually acutely aware of their perceptual-motor deficiencies as they attempt to compete in recreational skills with more skilled children.

These data indicate that programs for such children should include activities designed to enhance skills given status by their peers, as well as tasks designed to enhance perception, balance, and locomotor agility. It is a common finding that tasks in these latter categories have to be "sold" to the child who is Educationally Handicapped, as he frequently feels that they are beneath his ability.

The motor skill of EH's is a more specific than is evidenced by the TMR's thus justifying the inclusion of a wider variety of activities for the former group. In summary activities designed to enhance basic locomotor tasks including crawling, walking, jumping, etc., activities in body-part perception, balance tasks, together with motor skills which form the basis for culturally desired sports and games would seem to compose the most meaningful program for the Educationally Handicapped child.

CHAPTER V
SUMMARY AND CONCLUSIONS

Initially a battery of tests was constructed composed of tasks intended to evaluate six perceptual-motor attributes of mentally retarded youth. These sub-tests consisted of tasks evaluating body-perception, gross agility, balance, locomotor agility, throwing behavior, and the ability to track balls. The battery of tests was designed so that it would be administered in from twenty to thirty minutes using a minimum of equipment, by individuals who could be trained in about two hours. The composition of the test battery was decided upon with the aid of members of the Advisory Committee in addition to reference to previous investigations of a similar nature.

Following formulation of the test battery eighty-three children at two locations were each tested twice in order to determine the reliability of the tests and of the total battery. Inter-test correlations were also computed based upon the data collected during this initial phase of the project. Three testors were involved in this first phase of the project, two men and one woman. Each male subject in the initial sampling was tested once by each male testor. The females in the initial sampling were tested twice by the female tester. The tests were administered on consecutive days, and, whenever possible, at the same time of day.

During the second phase of the project an additional 116 children were tested once, at ten different testing sites by the same tester, a male psychometrist with the Special Education Branch of the Los Angeles City School District. Twenty-three of these latter subjects were identified as having cerebral palsey, and their scores were omitted from the final analyses. Thus the scores of the remaining ninety-three subjects in Phase II were combined with the scores obtained in the first testing of the initial eighty-three subjects in order to draw conclusions relative to inter-group differences, to arrive at implications for educational programs for the mentally retarded and to formulate norms for the perceptual-motor abilities of Trainable and Educable Mentally Retarded, for children with Down's Syndrome, and for the Educationally Handicapped child.

Analyses of the scores obtained during the initial portion of the investigation (Phase I) revealed that the test battery was highly reliable (r=.92) as were individual tests within the battery (r's ranged from .75 to .84). Correlation matrixes computed, based upon these data revealed that higher inter-test relationships were apparent when the scores of the Trainable Mentally Retarded were compared than when similar measures obtained from the Educable Mentally Retarded were contrasted. A moderate (+.54) positive correlation was obtained when age and total battery score were compared. Significant differences were obtained when the scores of the Trainable and Educable Mentally Retarded were compared, on every test except Ball Tracking, with the latter group superior. A similar analyses carried out during Phase II of the study revealed even more significant differences between the abilities of the Educable and Trainable Mentally Retarded in every test administered and when the total battery scores were compared (t=15.42, p.001).

A survey of the nature of the total subject population (177) revealed the following: 67% were male, while 74% were Caucasians, with the remainder Negro (with the exception of 2.3% who were Oriental). 46% of the subjects were classified as TMR's (Trainable Mentally Retarded) with the remainder of the subjects evenly split between Educable Mentally Retarded, and the Educationally Handicapped (38 subjects, 18.2% of the subject population in each Group. 36% of the Trainable Mentally Retarded subjects were classified as evidencing Down's Syndrome. The mean age of the 177 subjects was 11.40 years, with a range of from five to twenty-four years.

Inter-group comparisons resulted in the following conclusions: The sub-categories of subjects classified as EMR and Educationally Handicapped were significantly superior in all tests to subjects classified as Trainable Mentally Retarded and to children evidencing Down's Syndrome.

The sub-group evidencing the most marked perceptual-motor deficiencies were children with Down's Syndrome. Particularly, difficulty was noted when they were asked to engage in tasks involving left-right discrimination, in balance tests, and in skills involving the pairing of movement with vision. Hopping in squares, tracking balls and the like were performed successfully by only a small per-cent of these children. The children with Down's Syndrome were significantly inferior to the TMR's in the Balance, Locomotor Agility, and Throwing categories.

The primary problems evidenced by the EMR's involved the performance of balance tasks, and in body-part perception. Their crawling and walking behavior was usually normal (all but two could crawl with an appropriate cross extension pattern.) Balance scores were highly correlated with their total scores in the battery (r=.90).

The TMR's evidenced even greater difficulties than the EMR's in balance tasks, body-part perception (the ability to make correct left-right discriminations was absent in this population). Similar to the EMR's however, their ability to crawl with an appropriate cross-extension pattern was usually apparent (evidenced by over 90% of the TMR's). The score most predictive of the overall performance of the TMR's was obtained in the Body-Part Perception category (=.84).

One-third of the Educationally Handicapped children failed to evidence appropriate cross-extension patterns when crawling and walking. They also had difficulty when balancing, and in hopping and jumping accurately, with visual monitoring. Over-all the perceptual-motor profile evidenced by the EH's, was similar to that of the EMR's, and was in all cases significantly superior to the scores of the TMR's and to those of the children with Down's Syndrome.

Developmentally the EMR's and Educationally Handicapped evidenced the best functioning during late childhood and early adolescence, with some deterioration noted in their perceptual-motor profile during late adolescence and early adulthood. The balance scores of the Monogoloid children remained relatively fixed despite increasing age. Significant changes, with age, on the part of children with Down's Syndrome were reflected in tracking ability, in gross agility, and in body-part identification and in the score for the total battery.

No significant differences between any of the scores achieved by the Negro and Caucasian subjects were recorded. Similarly no differences were found between any of the scores posted by boys as compared to scores achieved by the girls.

When the I.Q.'s available for thirty-seven subjects were compared to their total test scores, an r of +.63 was obtained.

The specificity of perceptual-motor functioning evidenced by the EH's and EMR's suggested that a greater variety of activities are needed within their programs than in the programs for the TMR and should include tasks intended to reheighten an awareness of body-parts, of body-to-object relationships and activities to improve balance and agility. Emphasis should also be placed upon activities intended to improve visual-motor integration which will lead to more proficient skills in sports performance.

Emphasis in programs for the TMR should be placed on relatively few activities including balance, body-part identification, body to object relationships, and agility.

In the case of the Monogoloid sub-population of Trainable Retarded Group emphasis should be placed upon tasks involving tracking, visual-motor integration, i.e. hopping in squares, over lines etc., and in body-part and left-right discrimination.

Future investigations are planned to study the effect of long term educational programs upon the perceptual-motor attributes [illegible] and upon selected measures of general intellignece. Further analyses are planned to explore relationships between tasks involving body part perception, left-right discrimination, I.Q., body-to-object relationships, and other perceptual-motor abilities of various types. A comparison of the data obtained to the performance of normal children is also planned.

APPENDIX A

TEST ADMINISTRATION

TEST ADMINISTRATION

GENERAL INFORMATION

1. All children should be tested individually in well-lighted rooms approximately 30 by 30 feet in size, with a ceiling about 9 feet in height. There should be no obstructions in the room.

2. Only the tester should be present, and administration time should be about thirty minutes, depending upon whether part or all of the second level is administered.

3. All tests should be described verbally, and then demonstrated in exactly the same way the tester wishes the movement to be executed by the child. When it is indicated in testing directions, the tester may assist the desired movement.

4. The tester should follow the directions outlined for the administration of each test as closely as possible. The child should be given every encouragement, and if he asks "how he is doing?" he should be positively reinforced.

5. The initial test administered in Level I should be Ball Throwing, in order to gain rapport with the child, with this exception the tests should be administered in the order given.

6. Each child should be first administered all tests in Level I if his average score at this Level is 4.0 or better he should be administered the tests in Level II, or if any single test in Level I reachs a score of 5.0 he should be given the test in the corresponding category in Level II. Only 5 points is possible for each test at each level, total 10 points per category, 60 points possible in the total test.

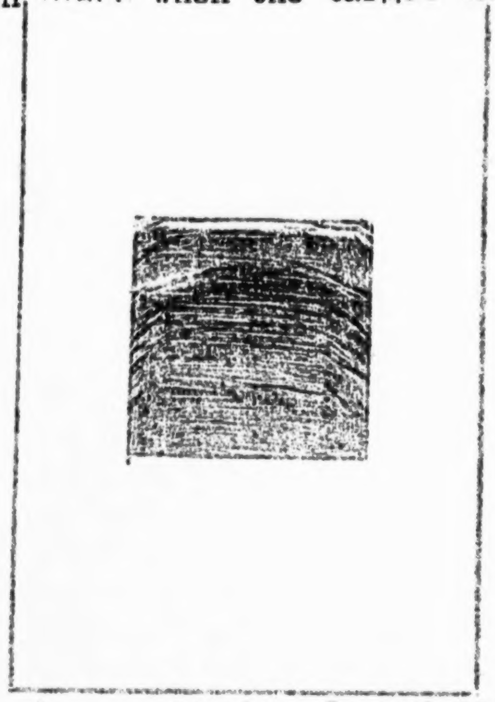
7. The child should be brought into the room with the tester, introduced, and informed that he "will be playing some games with (tester), for a few minutes." The word "test" should not be used.

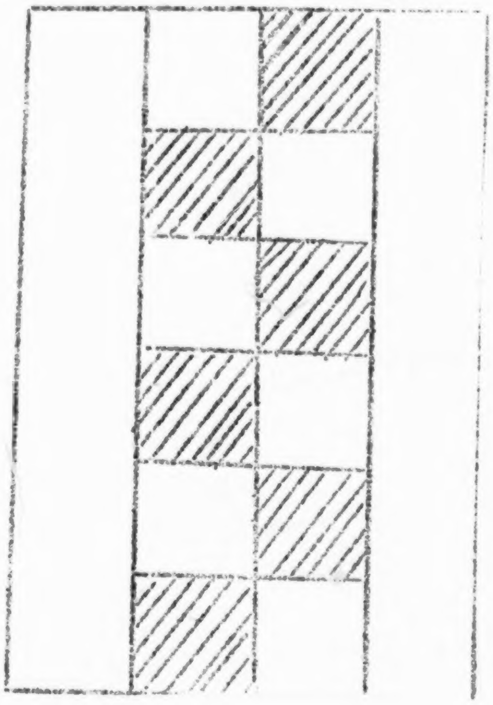
A. Equipment needed

1. 1 rubber, air-filled playground ball, dark red in color, and $8\frac{1}{2}$ inches in diameter.

2. A solid white rubber softball, containing a metal cleat so that it can be suspended by a white string. The ball should have a circumference of 12", and the string attached to it should be 18" in length.

3. A foam-plastic, canvas covered mat, 4' by 6' and $1\frac{1}{2}$" thick should be used. This mat should be marked off in 12 one-foot squares, as shown below. Alternate squares should be marked with diagonal lines as shown on one side of the mat. In the center of the reverse side of the mat a black oil-cloth square 2' by 2' should be placed, when the target throw is evaluated. All of the tests except the pattern jumping should be given on this reverse side, and the black target should only be in place when the target throw is administered.





4. A clip-board, and scoring sheets.

5. A stopwatch, or a watch with a secondhand.

6. The mat is Style 806, 4' x 6', costing $2.30 per square foot, color solid blue, and may be ordered in the Los Angeles[1] area from Paramore-Baier 146 So. Robertson Blvd., Los Angeles 48.

7. The lines on the mat are made with 1" yellow scotch tape, #471.

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[1] These mats have Valero touch fasteners on the 6' edges to permit instant attachment. They have rubberized fabric on their underside to prevent them from slipping. They are made from $1\frac{1}{2}$ inch shock absorbing polyethylene foam covered with a touch vinyl blue covering.

TEST ADMINISTRATION

B. LEVEL I

Test I BODY PERCEPTION

Equipment: 1 4' by 6' mat

Preparation: The child should be placed, standing on the floor, with his toes against the mid-point of the 4 foot edge of the mat. The tester should stand next to the child, with his feet on the floor.

General Considerations: The tester should describe and then demonstrate each movement, and then arise from the mat permitting the child to respond. The child should arise after each request and stand at the starting point described above. The child should be told "thank you" after attempting each movement.

TESTING:

a. "__(name)__, please lie down on the mat like this on your front or stomach." (Tester then lies on his stomach, his head away from the child, remains for two seconds, arises, and says...) "Now try to do it too." Point is given if the child lies on his stomach regardless of whether or not head is turned away from or toward the tester.

b. "__(name)__, now please lie down on the mat like this on your back." (Tester lies down slowly on his back, head away from the child, remains for two seconds, arises and then says "now try to do it too."

c. "__(name)__, now please lie down on the mat like this on your front or stomach, with your legs nearest me" (tester assumes lying position, with his legs nearest the child, arises and then says...) "Now try to do it too." The tester should then go to the far end of the 4' side of the mat, and face the child with the mat between them. Point is awarded only if feet are nearest the tester, and child is on his stomach.

d. "__(name)__, now please lie down on the mat on your side, like this..." (tester lies down on his left side, feet toward the child, arises, and then says...) "now you try to do it too." Point is awarded no matter which side the child chooses to lie upon, nor where the feet are relative to the tester.

e. The tester should then say, "Now let me see you lie down on your left side." This should not be demonstrated. A 5th point is awarded in this category if the child correctly lies on his left side.

Scoring: One point is given for correctly executing each of the following requests. No points are deducted for a slowly executed response. Total of five points possible.

(LEVEL I CONTINUED)

Test 2 GROSS AGILITY:

Equipment: 4' by 6' mat; stopwatch

Preparation: Child is asked to stand in the center of the mat, facing a 4' side and the tester. Tester should be ten feet away. Then the child should be asked to lie down in the middle of the mat, his feet toward the tester.

Instructions: After the child is in the above position, the tester should say "I would like to see how fast you can stand up and face me." A stop-watch should be started as the child's head leaves the mat, and stopped as he has his knees straight as he assumes a standing position, facing the tester. If the child does not understand; the tester should demonstrate standingup rapidly.

Scoring: 1 point if the child turns to his stomach first and then arises in more than 3 seconds.

2 points if the child turns to his stomach first and arises under three seconds.

3 points if the child sits up, without turning over, and stands up without turning his back to the tester taking more than three seconds.

4 points if the child sits up, remains facing the tester when arising, and does so in two seconds.

5 points if the child sits-up, remains facing the tester when arising, and does so under two seconds.

Note: A second-hand on the standard watch may be used in lieu of a stopwatch. Maximum points possible, five.

Test 3 BALANCE

Equipment: Stop-watch

Preparation: The tester should face the child on a level floor ten feet away.

Instructions: After getting the child in this position the tester should say..."I would like to see how long you can stand on one foot like this"...(the tester should demonstrate balancing on his left foot, using his arms to assist him and should then say..."Now you try it too." (Tester should demonstrate the held position for ten seconds).

Scoring 1 point if attempted and held under 1 second.
2 points if attempted and held from 2-4 seconds.
3 points if attempted and held from 4-6 seconds.
4 points if attempted and held over 6 seconds.

Second part: "now let's see if you can balance on one foot with your arms folded, like this." (Tester should demonstrate by posturing on one foot with arms folded across his chest for ten seconds).

Scoring: 5 points in this test if arm-folded balance is held from 3-4 seconds. Maximum five points possible.

Permit the child to remain balanced on both parts of this test for ten seconds, and then suggest that he stop. The scoring is not influenced by the foot he decides to balance upon...however, it should be the same foot throughout.

Test 4 LOCOMOTOR AGILITY

Equipment: 4' by 6' mat.

Preparation: Ask the child to stand on the floor, with his feet touching the mat in the middle of one of its 4' sides. The tester should place himself at the same end.

Instructions: After the child is in place, the tester says...

a. "__(name)__," "Let's see if you can crawl across the mat like this" (tester crawls on hands and knees in the correct pattern down the length of the mat away from the child, then toward the child and then the tester says) "Now you try it too." One point scored if a correct cross-extension pattern is seen in the crawling movement.

b. "__(name)__," "Let's see now if you can walk down the mat like this" (tester walks down the mat away from the child and then says) "Now lets see if you can do it too." Additional point is scored if cross-extension pattern is seen in gait.

c. "__(name)__," "Now can you jump across the mat like this" (Tester takes three to four jumps across the mat, using both feet together, and proper arm lift as he travels), and then says..."Now you try too..." One point is scored if the child leaves the ground two to three times during trip down the mat.

d. "__(name)__," "Now let's see you jump backwards down the mat like this..." (Tester jumps backwards toward the child and then says...) "Now let me see you do it..." A point is given if the child can jump backwards two to three times without falling down, proceeding down the mat. He is permitted to look behind himself when executing this test. Tester should return to the far end of the mat, and await the child, stop him and prevent him from falling on the floor as he completes his trip.

e. "__(name)__," "Now let's see you hop down the mat on one foot like this..." (Tester demonstrates one foot hopping, using his left foot across the mat away from the child. Then he says, "Now let me see you do it..." One additional point is scored if child is able to hop on one foot (either one) from two to three times down the mat. Maximum five points possible.

Test 5 BALL THROWING

Equipment: Rubber playground ball, 8" in diameter

Preparation: Ball is placed at the child's feet, tester faces the child, 15 feet away.

Testing: The child is asked to pick up the ball and threw it to the tester...the tester should say, "__(name)__," please pick up the ball and throw it to me..." (The tester should then execute a proper one-handed overhand throwing movement.) And at the same time should say, "Like this." The ball is rolled back to the child, and he should be permitted five throws.

Scoring: 1 point is given if he pushes the ball with his hands or feet.
2 points are given if he throws the ball, either overhand or underhand using both arms at the same time.
3 points are given if the ball is thrown with one arm without any body shift into the throw.
4 points are given if the child throws with a weight shift forward of the body, without proper step on the opposite foot.
5 points are given if the child throws with a weight shift at the time the ball is released, and with a step with the opposite foot occuring at the same time.

Give the child the proper score based upon the habitual way he selected to throw the ball, i.e. the manner in which he throws it three out of five times. Maximum five points possible.

Test 6 BALL TRACKING

Equipment: $8\frac{1}{2}$" rubber, air-filled playground ball

Preparation: The child should face the tester 10' away. The tester should hold the ball.

Testing: The tester should then say, "Now I will bounce the ball to you. Try to catch it any way you can...(The tester then throws the ball so that it bounces once before the child gets it...the ball should bounce so that it comes chest high to the child). (Two practice bounces are permitted to allow the child & tester to become oriented to the problem). The tester should then say..."Now do you understand...catch it any way you can, with one or two hands..."

Five throws should then be made to the child, bouncing the ball once. The ball may be returned by the child, any way he sees fit. About 5 seconds should be permitted between throws.

Scoring: Score one point for each time the ball is caught, and controlled by the child. Maximum five points possible.

LEVEL II

Test I BODY PERCEPTION

Equipment: Mat 4' by 6'

Preparation: The child is asked to lie on his back in the center of the mat, with his feet pointed toward the 4' end; the tester should stand at this end.

Testing: The tester should say..."___(name)__, now I am going to ask you to do certain things with your arms, and legs, please try to do them as quickly and as accurately as you can. "First close your eyes ..." Then the tester should say
1. "Raise your left arm in the air." Then the tester should wait until the child makes a decision and moves. Then the tester says, "Put your arm down now..."
2. The tester should then say, "Raise your left leg up." The tester should wait until the leg is decided upon and moved and then say, "Put your leg down now..."
3. The tester should then say, "Raise your right arm in the air." The tester should wait until the child selects an arm and raises it and should then say, "Put your arm down now."
4. The tester should then say, "Touch your left elbow with your right." After some movement is made, the tester should say, "Now bring your hand down again."
5. The tester should then say, "Touch your right knee with your left hand." After these movements are completed, the tester should ask the child to open his eyes and come to his feet.

Scoring: One point is awarded for each correctly executed movement. No points are deducted for slowly executed movements. If in numbers one through five, the movements are correct, but with wrong hand in every case...i.e. all movements backwards...a total of three points is awarded to the child for this test. Maximum of five points possible.

Test 2 GROSS AGILITY

Equipment: 4' by 6' mat.

Preparation: Child is placed in the center of the mat, standing and facing one of the six foot edges. The tester stands ten feet away facing the child.

Testing: "__(name)__," see if you can kneel down on one knee at a time, and then stand up on one leg at a time like this without touching anything." (The tester then executes a four count, one to the second, movement kneeling first on one knee, then on the second, then standing on the first foot and arising on two feet...the tester says then, "do you understand?" "Would you like to see it again?" If the child wished to see the movement again, the tester should do so...and after this second demonstration, the tester should then say, "Now you try it too."

Scoring: 1 point is awarded if the child uses his hands on his thighs and on the floor to assist him in descending and/or arising.

2 points are awarded if the child touches one or both hands to his thighs when ascending and descending, or if the child comes down to both knees at once, or gets both feet at the same time.

3 points are awarded if the child uses one or both hands while getting up only, or if he falls to one knee while arising.

4 points are awarded if the child executes movement without the use of the hands, but there is general unsteadiness,...i.e. extra steps taken as the child resumes his feet, etc.

5 points are awarded if the child executes movement perfectly with the hands at the sides, not assisting the movement, and with the feet coming down and up separately.

No points are deducted if the child comes up first with a different foot from the one kneeled upon. Maximum five points possible.

Test 3 BALANCE

Equipment: Stop-watch

Preparation: Place the child in the standing position, on a level floor and facing away from obstacles with the tester ten feet away.

Testing: After placing the subject in the position described above, the tester should say, "I would like to

(a) see how long you can stand on one foot like this," (The tester should fold his arms) with your arms folded and stand on one foot for ten seconds."

(b) If the child can accomplish this for five seconds or more, the tester should say, "I would now like you to balance on one foot like this, with your arms at your sides, and your eyes closed."

(c) If the child can accomplish this for five seconds or more, the tester should say, "I would like you to balance on one foot with your eyes closed and your arms folded like this." The tester should demonstrate with eyes closed, an arm-folded, one foot balance.

(d) If the child can accomplish this for five seconds...the tester should say, "Now try to balance on one foot with your eyes closed, arms held at your sides, but using the other foot this time..." The tester should be aware of the foot preferred by the child, and request that the opposite one can be used.

(e) If the child can accomplish this for five seconds, the tester should say, "Now try to balance on the same foot (non-preferred) with your arms folded and your eyes closed.

Scoring: One point is scored for each of the tests above completed successfully, i.e. held over 5 seconds. No points are given if the arms become unfolded, if they are required to be folded...nor if the child opens his eyes when they are required to be closed.

In each case the stop-watch should be started, or the second hand observed, as the foot leaves the ground, and stopped when it touches the next time. "Arms at your sides," means that the child can use the arms for maintaining his balance in any way that is helpful.

From 10 to 15 seconds rest should be permitted between trials. Maximum five points possible.

Test 4 LOCOMOTOR AGILITY

Equipment: 4' by 6' mat laid out in 12 one-foot squares.

Preparation: The child should face the tester at the far end of the middle of a 4' side. The tester should stand on the floor with his feet at the middle of the other end of the four foot side of the mat, facing the child.

Testing: With the child and tester in the above positions, the tester should say...

(a) "Now let's see if you can jump down the mat like this... (the tester then jumps two feet at a time down the mat moving straight ahead, and jumping carefully in all six squares)...The tester should then say..."Now let's see you do it...be sure to jump in each square and move straight ahead."

(b) After this is attempted, the tester should say, "Now let's see you jump back and forth (using only the unmarked squares so that he jumps forward with each jump) like this...the tester should then say, "Now let's see you do it...be sure to jump only in the unmarked squares..."

(c) After this is attempted, the tester should say, "Now let's see you jump backwards down the mat like this (the tester should jump directly backwards down the mat, using both feet, and landing in all six squares.) The tester should then say, "Now let's see you do it too...be sure to jump in all six squares." The child can be permitted to look backwards as he jumps.

(d) After this is attempted, the tester should say, "Now let's see you hop down the mat like this (the tester should then hop on the mat straight ahead, using all six squares) the tester should then say, "Now let's see you do it. Jump in each square and move straight ahead."

(e) After this is attempted, the tester should say, "Now let's see you hop down the mat like this...(the tester should then hop on one foot, hopping only in the unmarked squares, so that every hop moves him forward and from side to side..." The tester should then say..."Now let's see you do it too...be sure to hop in the unmarked squares..."

Scoring: One point is given for each successful trip, i.e. one with less than two errors in it. An error is scored when a foot (or feet) does not land in a square, when the second foot is touched, when hopping on one foot, or when an extra step is taken in a square. Maximum five points possible.

10 to 15 seconds rest should be permitted between trips. Either foot may be used for hopping, but the same foot must be used for each trip.

Test 5 BALL THROWING

Equipment: Playground Ball 8' in diameter. 4' by 6' mat with target side up.

Preparation: The child should stand fifteen feet away from the 4' end of the mat.

Testing: After the child has assumed the above position, the tester should stand next to him and throw the ball toward the mat's center on which is painted a 2' by 2' square "target." This should be done three times...and the tester should then say, "I would like to take this ball and try to make it drop in the center of the mat...Do you understand?"

If the child is aware of the nature of the task he is permitted to throw, either overhand or underhand, with one or two hands, at the target...5 times.

Scoring: 1 point is given if three attempts have hit the mat, but not the center target.

2 points are given if five attempts have hit the mat, but not the target.

3 points are given if two attempts have hit the target regardless where other throws have landed.

4 points are given if three attempts have hit the target, regardless where other throws have landed.

5 points are given if four or five throws land within the target.

The child receives one of the scores above: i.e. highest score possible, five points.

Test 6 BALL TRACKING

Equipment: Rubber softball hung on a string.

Preparation: The tester should face the child about two feet away, he should ask the child to extend his arm at the shoulder, fist clenched. He should then suspend the ball on the 15" string so that it hangs, when motionless at the level of the child's chin (top of the ball just under the chin), and a distance away determined by the length of the child's arm plus the clenched fist.

The ball should then be suspended by the tester's left hand so that it hangs as described above. The ball should then be grasped with the tester's right hand, brought to a position which makes the string horizontal, and released so that it swings from the child's left to right in a vertical plane, parallel to the one in which the child is standing.

Testing: The tester should then permit the ball to swing back and forth in this manner 6 times and ask the child to watch it. The tester should then say: "See this ball swing back and forth? See if you can touch it with one finger like this," (The tester holds the ball motionless with one hand, and uses the opposite index finger on the ball touching it quickly with the tip of the opposite index finger.) "as it passes by you."

The tester should then hang the ball in front of the child and make sure that he starts his movement from his side, and that the touch is made directly in front of the child.

The tester should start the ball five times, allowing it to swing past the child three times after each release. As soon as the child touches it or attempts to, or the hand is extended, the ball comes back on it, and stops...the ball is stopped by the tester and started again.

Scoring: Score one point (maximum five) for each time during each of the five sets of three swings each that the child is able to touch the ball. Make sure that no score is given if the ball touches them and, i.e. as it swings back to the extended hand after a "miss" has occured.

INDIVIDUAL PROFILE SHEET

________________ (Child's Name), ________________ (Tester), ________________ (Date), ________________ (Location)

__________ C.A.__________ SEX__________ HEIGHT__________ WEIGHT__________

		BODY PERCEPTION	GROSS AGILITY	BALANCE	LOCOMOTOR AGILITY	THROWING	TRACKING	
	0	o	o	o	o	o	o	0
LEVEL I	1	o	o	o	o	o	o	1
	2	o	o	o	o	o	o	2
	3	o	o	o	o	o	o	3
	4	o	o	o	o	o	o	4
	5	o	o	o	o	o	o	5
LEVEL II	1	o	o	o	o	o	o	1
	2	o	o	o	o	o	o	2
	3	o	o	o	o	o	o	3
	4	o	o	o	o	o	o	4
	5	o	o	o	o	o	o	5

TOTAL BATTERY SCORE________

AVERAGE PER TEST CATEGORY________

REMARKS____

DATA COLLECTION SHEET

__________________________, ______________________, ______________
Child's Name Tester Adm. No.

LEVEL I BODY PERCEPTION

Stomach__________
Back__________
Legs Near__________
Side__________
Left Side__________

GROSS AGILITY

turns to stomach, over 3 secs.__________
turns to stomach, under 3 secs.__________
faces tester, over 3 secs.__________
faces tester, in 2 secs.__________
faces tester, under 2 secs.__________

BALANCE

under 2 secs.__________
2-4 secs.__________
4-6 secs.__________
over 6 secs.__________
Arm folded, 3-4 secs.__________

LOCOMOTOR AGILITY

Cross-Pattern Crawling__________
Cross-Pattern Walking__________
Two-foot jumps, 2-3__________
2-3 backwards jumps__________
2-3 one-foot hops__________

BALL THROWING

Pushes Ball__________
Two-hand throw__________
One-hand arm only__________
One-hand weight shift__________
one-hand, step, weight shift__________

BALL TRACKING

Record number of successful catches out of 5 attempts__________

LEVEL II BODY PERCEPTION

Left arm__________
Left leg__________
Right arm__________
Left elbow with right hand__________
Right knee with left hand__________

GROSS AGILITY

Hands on knees and floor__________
Hands on knees, up and down__________
Hands on knees, up only__________
No hands, clumsy finish__________
Good Execution__________

BALANCE

5 secs. arm-folded__________
5 secs. eyes-closed__________
5 secs. eyes-closed, arms-folded__________
5 secs. eyes-closed only non-pref foot__________
5 secs. eyes-closed, arms-folded, non-pref__________

LOCOMOTOR AGILITY

Jumping straight ahead__________
Jumping in empty squares__________
Jump backwards all squares__________
Hop straight ahead__________
Hop in empty squares__________

BALL THROWING

3 hits on mat__________
3 hits on mat, none on target__________
2 hits on target__________
3 hits on target__________
4-5 hits on target__________

BALL TRACKING

Record number of successful touches__________

APPENDIX B

Decile Rankings for various sub-groups in total test battery, classified by age

DECILE RANKINGS OF SCORES IN THE TOTAL BATTERY FOR THE TMR'S, CLASSIFIED BY AGE

DECILE	AGE 5-6 YRS	7-8 YRS	9-10 YRS	11-12 YRS	15-16 YRS	17-20 YRS	21-24 YRS
10	28+	32+	47+	31+	41+	46+	48+
9	24-27	27-31	32-46	26-30	35-40	42-45	43-47
8	21-23	23-26	28-31	24-25	24-25	30-24	39-42
7	18-20	20-22	25-27	20-23	26-29	36-37	35-38
6	15-17	17-19	22-24	17-19	22-25	33-35	32-34
5	12-14	13-16	18-21	14-16	17-21	30-32	28-31
4	9-11	10-12	14-17	11-13	13-16	27-29	25-27
3	6-8	6-9	11-13	7-10	9-12	23-26	21-24
2	2-5	1-5	5-10	3-6	2-8	19-22	15-20
1	1-	0	4-	5-	2-	18-	
	M=14.42 SD=10.06	M=15.96 SD=11.88	M=20.65 SD=11.93	M=16.30 SD=13.78	M=21.20 SD=10.28	M=32.12 SD=10.28	M=31.10 SD=12.58

Locate the child's raw score in the proper age column. Decile ranking indicated in left hand column indicates approximate placement of the child's score in the total population surveyed in this investigation, i.e., child with a decile ranking of "3" has achieved a score on the total battery which is better than 70% of other children his same age and mental level.

DECILE RANKINGS OF SCORES IN THE TOTAL BATTERY FOR THE EH'S, CLASSIFIED BY AGE

DECILE	AGE			
	5-8 YRS	9-10 YRS	11-12 YRS	13-16 YRS
1	23+	57+		60
2	20-22	54-56	60	55-59
3	17-19	50-53	58-59	51-54
4	15-16	46-49	54-57	49-50
5	14-15	43-45	50-53	45-48
6	13-14	40-42	45-49	42-44
7	11-12	37-39	40-44	40-41
8	8-9	34-36	35-39	37-39
9	5-7	30-33	27-34	34-37
10	4-	29-	33-	
	M=13.95 SD=6.71	M=41.95 SD=9.18	M=48.84 SD=16.83	M=44.23 SD=8.14

Locate the child's raw score in the proper age column. Decile ranking indicated in left hand column indicates approximate placement of the child's score in the total population surveyed in this investigation, i.e. a child with a decile ranking of "3" has achieved a score on the total battery which is better than 70% of other children his same age and mental level.

DECILE RANKINGS OF RAW SCORES IN THE TOTAL BATTERY FOR THE EMR'S

DECILE	AGE			
	5-8 YRS	9-10 YRS	11-14 YRS	15-20 YRS
1	56+	47+	54+	45+
2	48-55	45-46	50-53	41-44
3	41-47	43-44	47-49	38-40
4	36-40	41-42	45-46	36-37
5	30-35	39-40	43-44	34-35
6	25-29	36-38	40-42	31-33
7	20-30	34-35	37-39	28-30
8	13-29	32-33	35-36	25-27
9	4-12	30-31	31-34	22-25
10	3-	29-	30-	21-
	M=30.03 SD=19.85	M=38.19 SD=6.82	M=41.95 SD=8.53	M=32.95 SD=8.80

Locate the child's raw score in the proper age column. Decile ranking indicated in left hand column indicates approximate placement of the child's score in the total population surveyed in this investigation, i.e., a child with a decile ranking of "3" has achieved a score on the total battery which is better than 70% of other children his same age and mental level.

DECILE RANKINGS OF SCORES IN THE TOTAL BATTERY FOR THE CHILDREN WITH DOWN'S SYNDROME, CLASSIFIED BY AGE

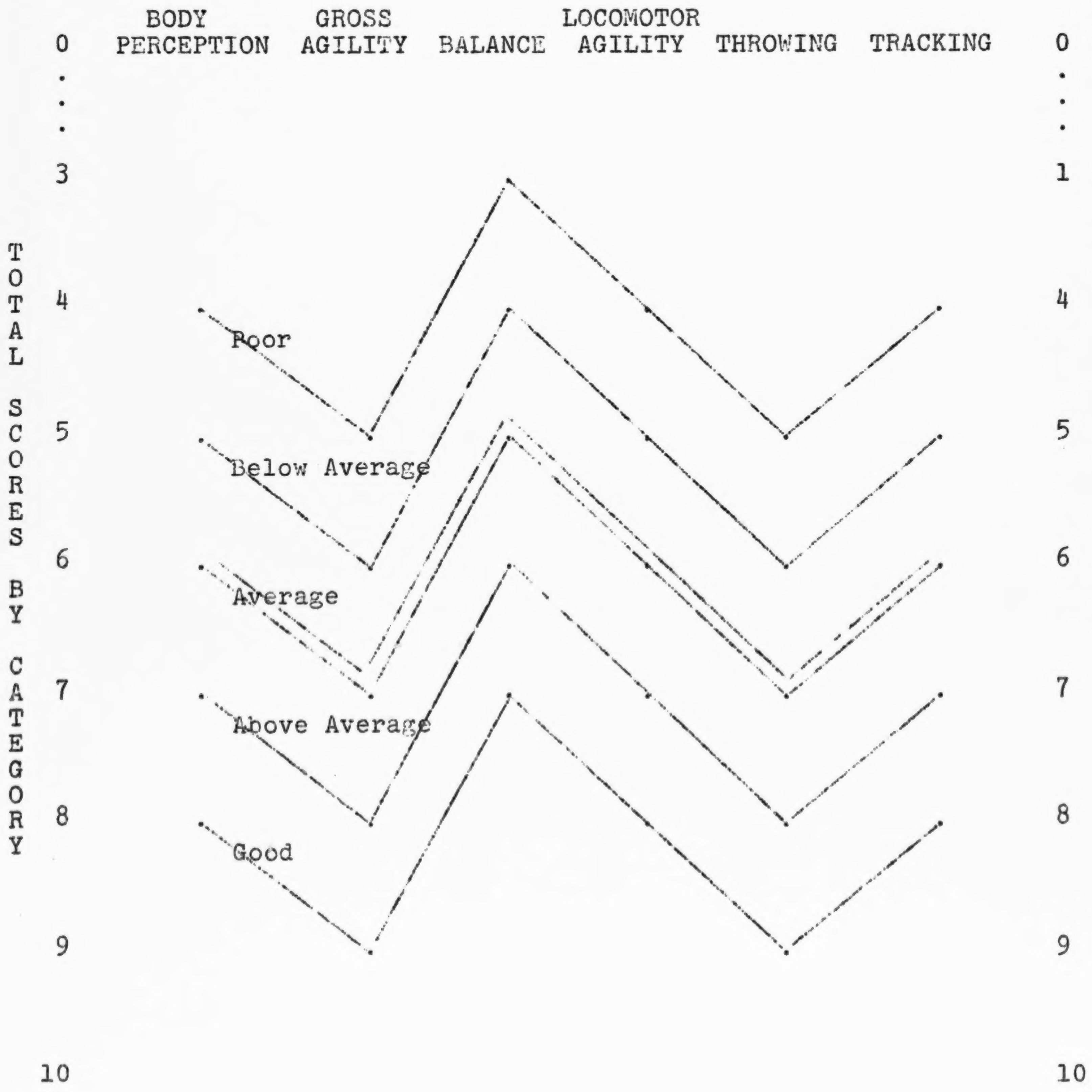
DECILE	AGE				
	5-8 YRS	9-12 YRS	13-14 YRS	15-18 YRS	19-22 YRS
1	20+	25+	23+	40+	30+
2	18-19	2-24	21-22	37-39	28-29
3	17	20-21	19-20	32-36	26-27
4	15-16	18-19	18	28-31	24-25
5	13-14	15-17	16-17	25-27	22-23
6	11-12	13-14	14-15	19-24	20-21
7	10	11-12	13	15-18	18-19
8	9-8	9-10	11-12	11-14	17-16
9	7	6-8	9-10	6-10	14-15
10	6-	5-	7-	5-	13-
	M=13.95 SD=4.79	M=15.46 SD=6.71	M=16.23 SD=5.00	M=21.11 SD=13.03	M=21.76 SD=5.39

Locate the child's raw score in the proper age column. Decile ranking indicated in left hand column indicates approximate placement of the child's score in the total population surveyed in this investigation, i.e., a child with a decile ranking of "3" has achieved a score on the total battery which is better than 70% of other children his same age and mental level.

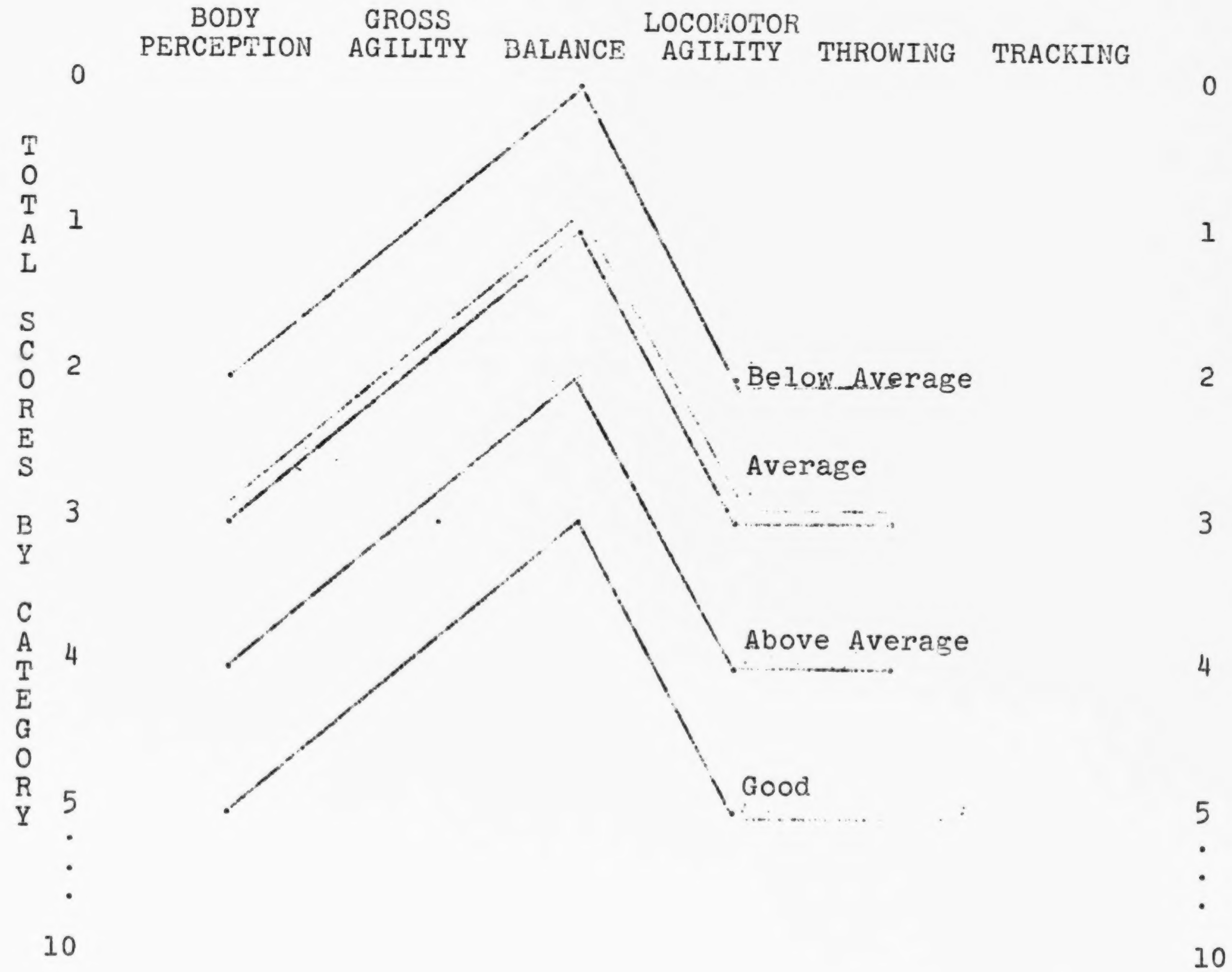
APPENDIX C

Norms for individual tests, by sub-group and by age

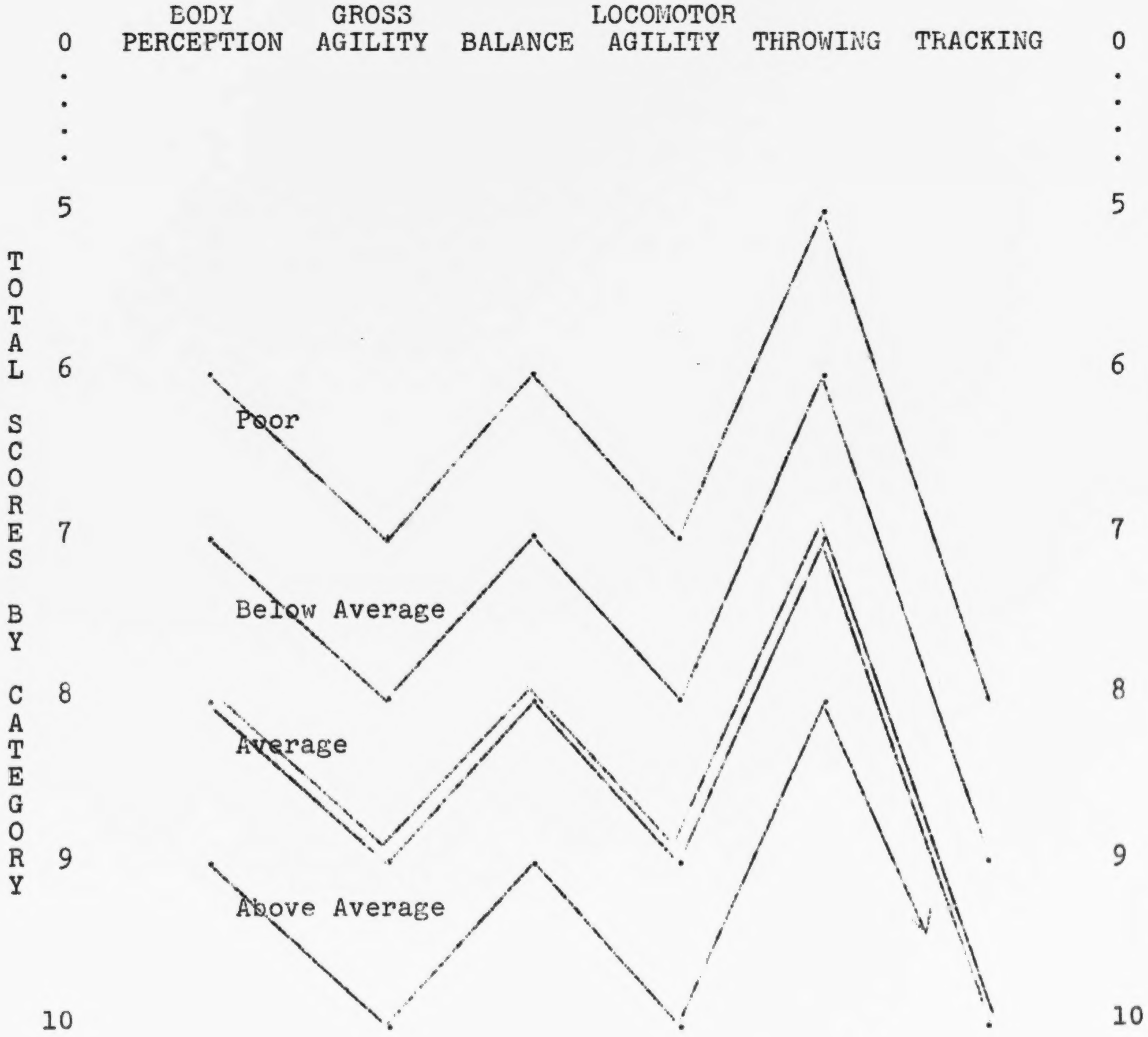
NORMS OF THE EDUCABLY MENTALLY RETARDED BY TEST, AGES 5-8 YEARS



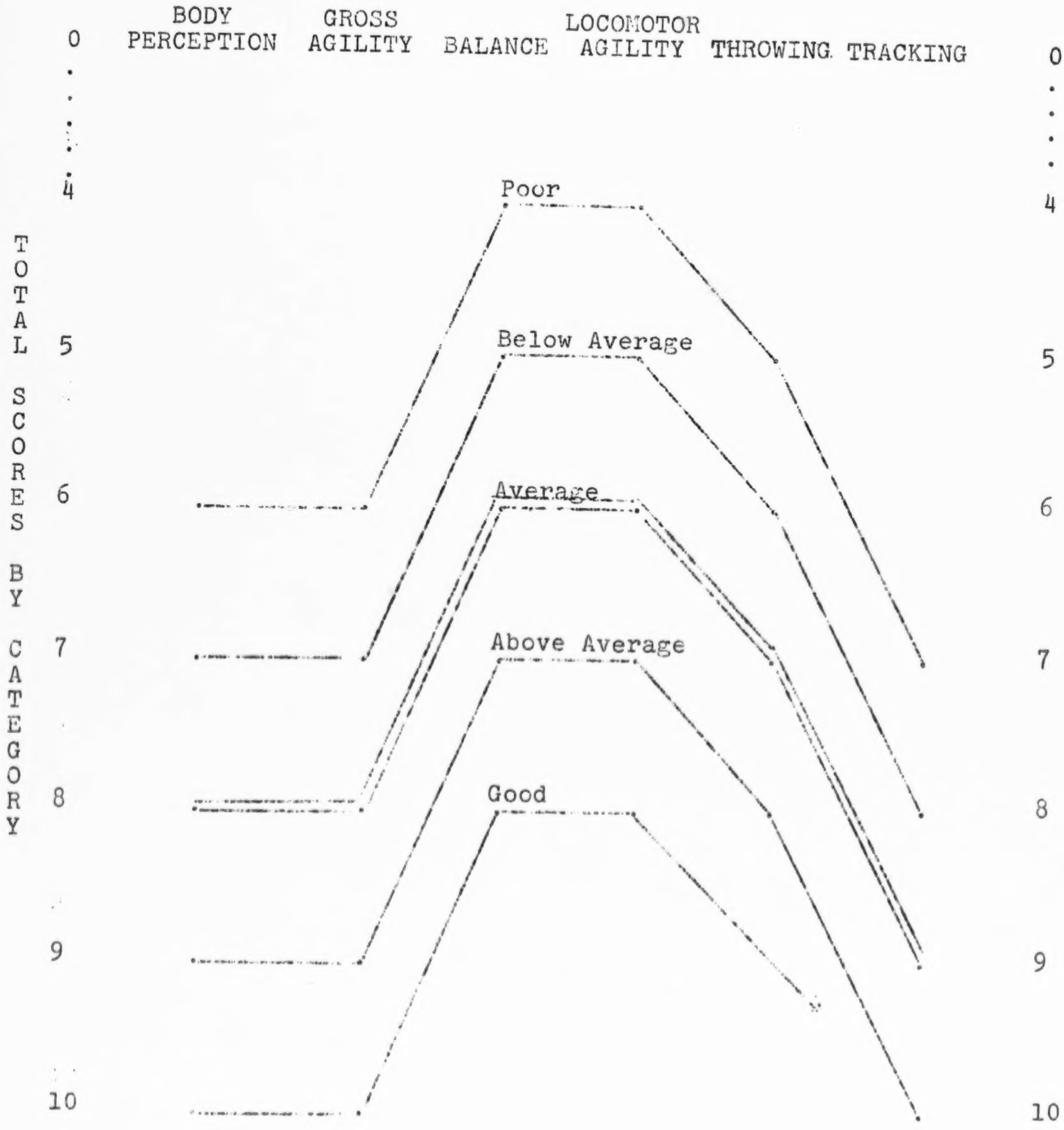
NORMS OF THOSE WITH DOWN'S SYNDROME
BY TEST, AGES 5-8 YEARS.



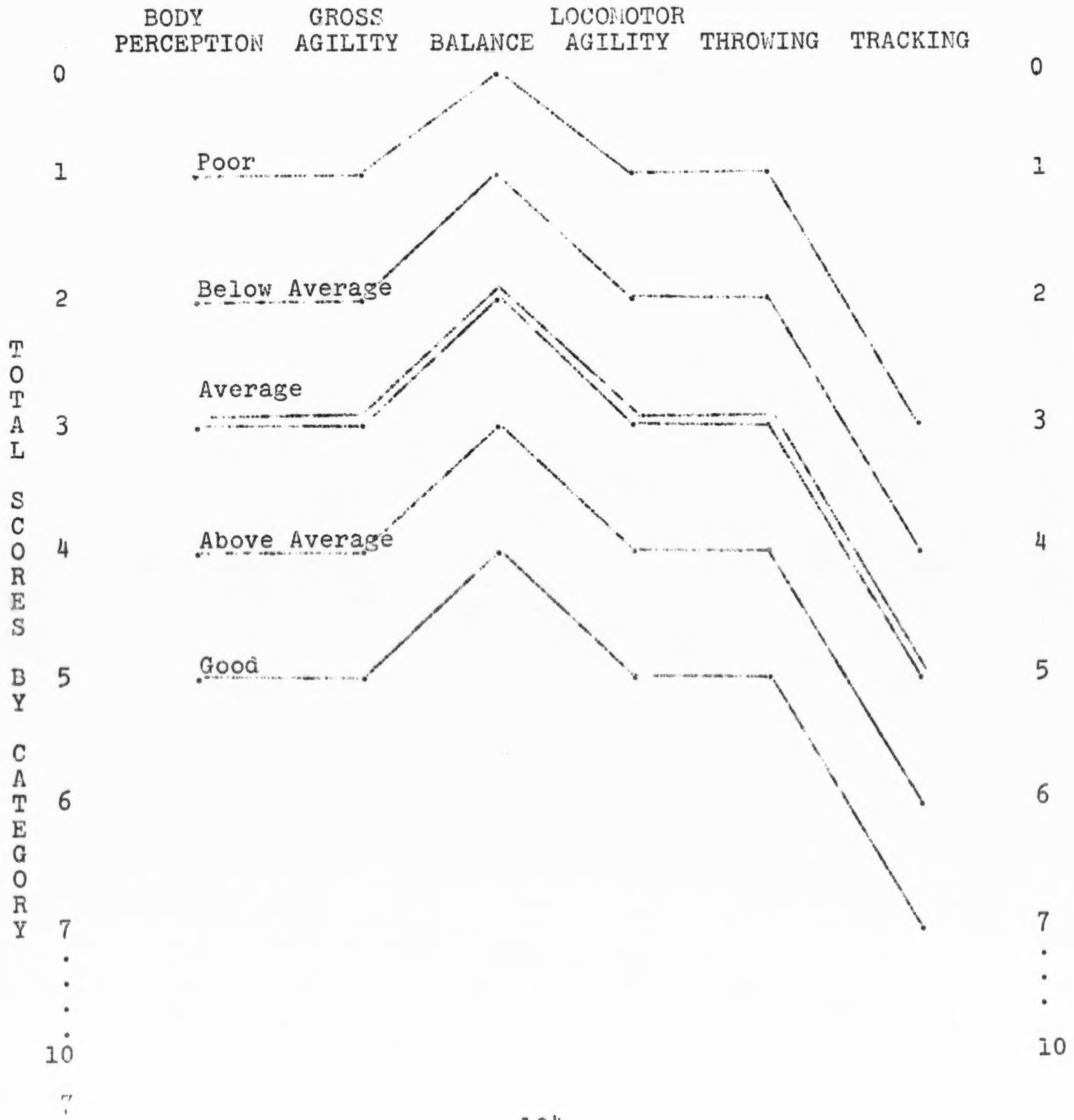
NORMS OF THE EDUCATIONALLY HANDICAPPED
BY TEST, AGES 11-12 YEARS



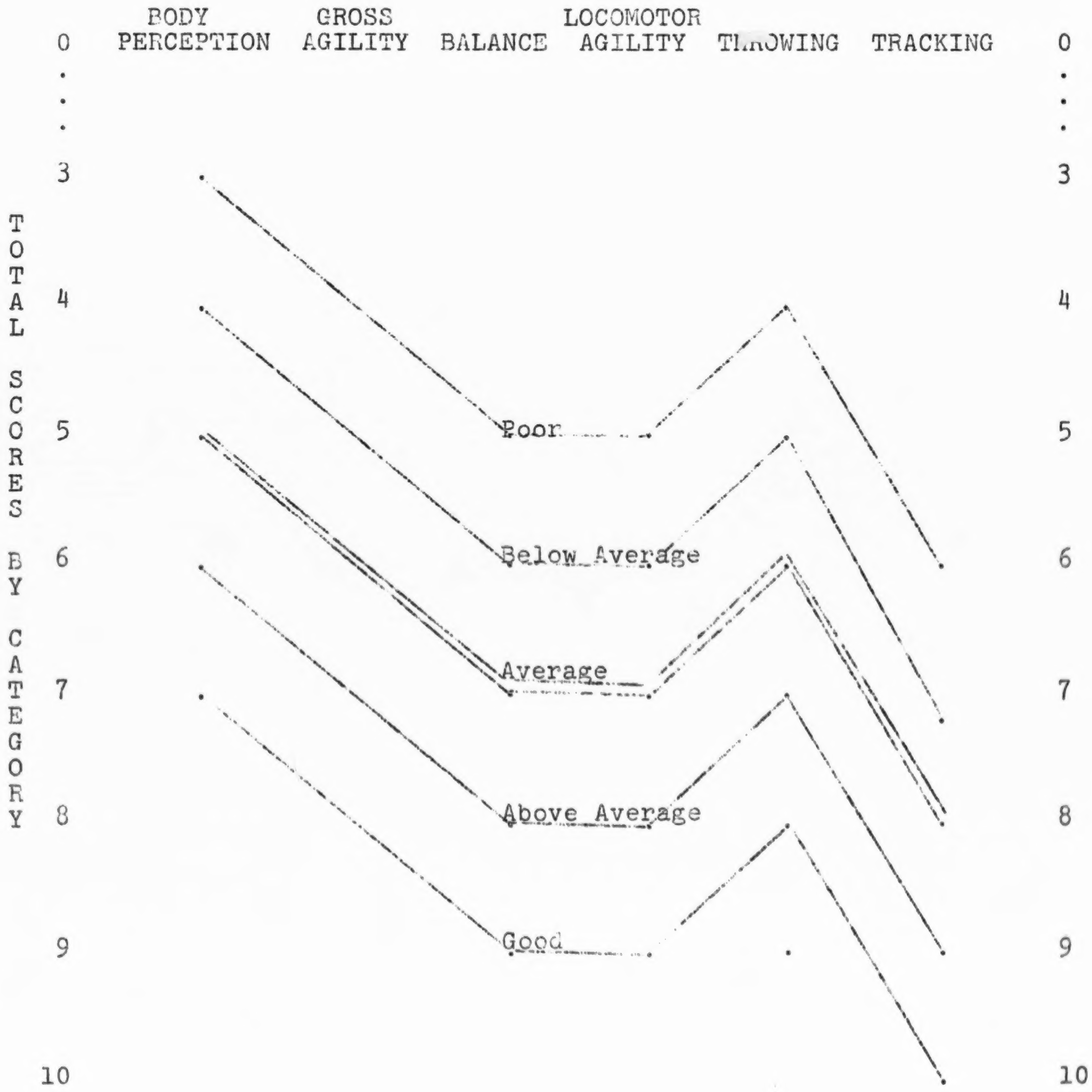
NORMS OF THE EDUCATIONALLY HANDICAPPED BY TEST, AGES 13-16 YEARS



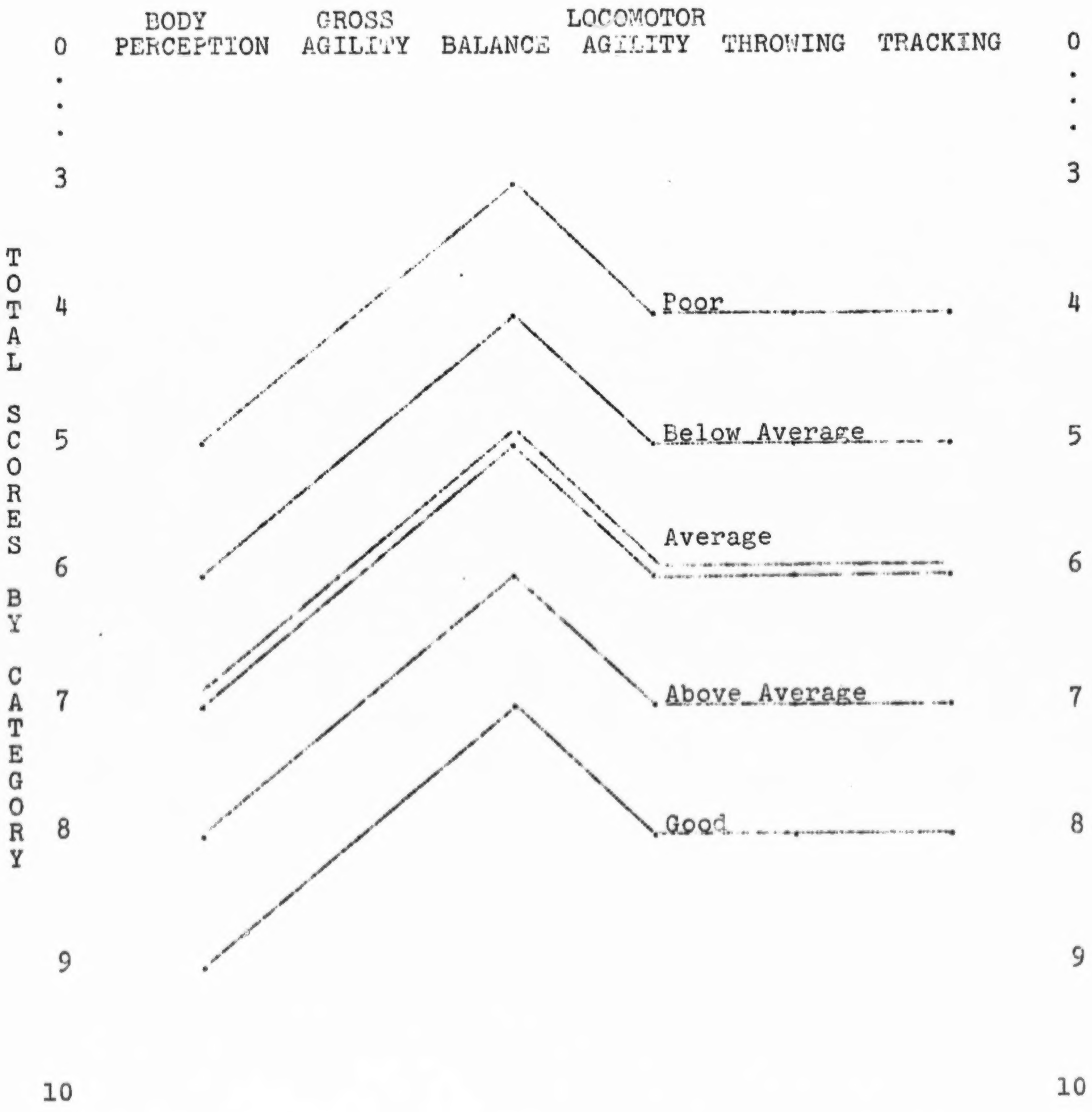
NORMS OF THE EDUCATIONALLY HANDICAPPED
BY TEST, AGES 5-8 YEARS



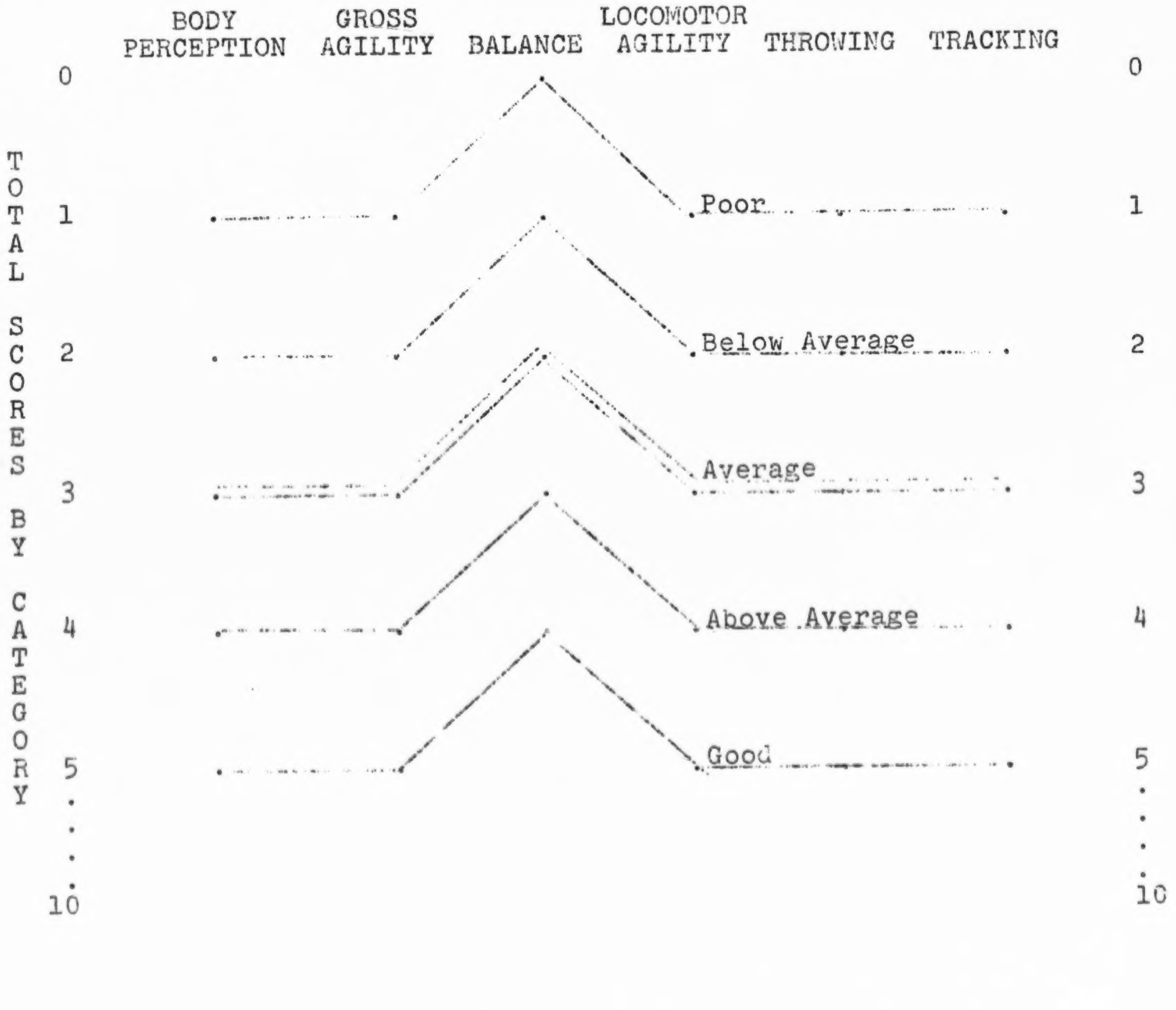
NORMS OF THE EDUCATIONALLY HANDICAPPED
BY TEST, AGES 9-10 YEARS



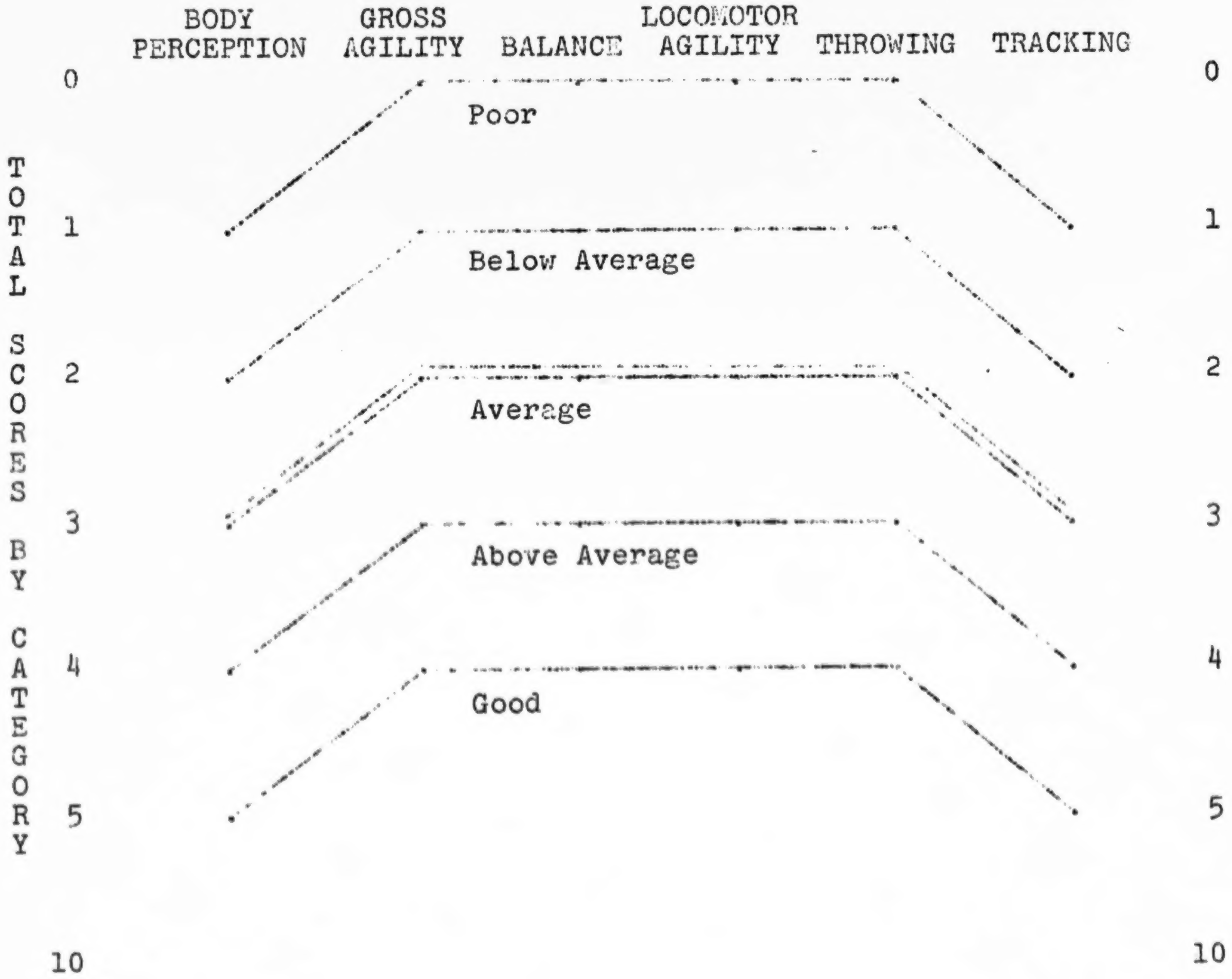
NORMS OF THE EDUCABLY MENTALLY RETARDED
BY TEST, AGES 15-20 YEARS



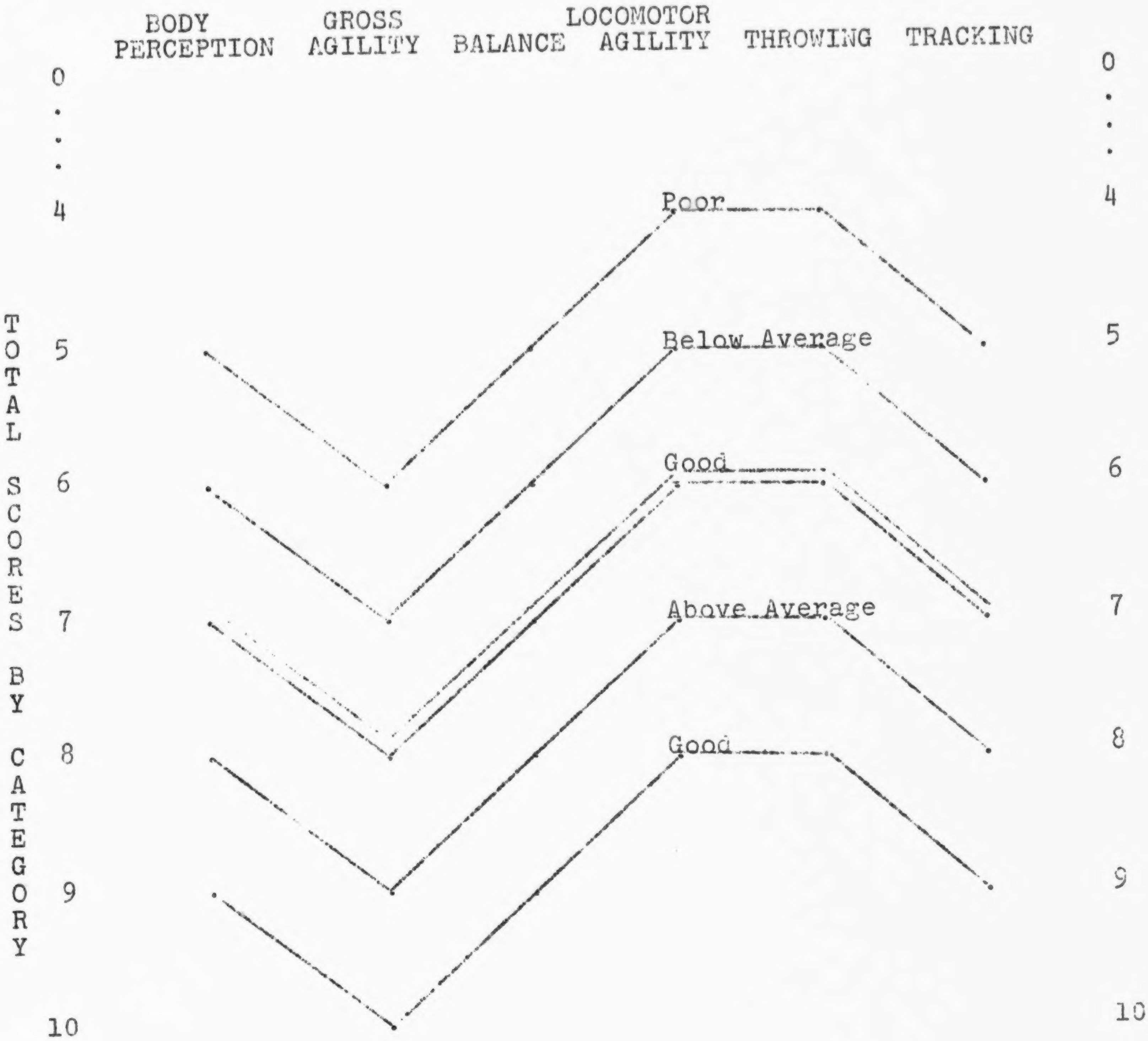
NORMS OF THE TRAINABLE MENTALLY RETARDED BY TEST AGES 7-8 YEARS



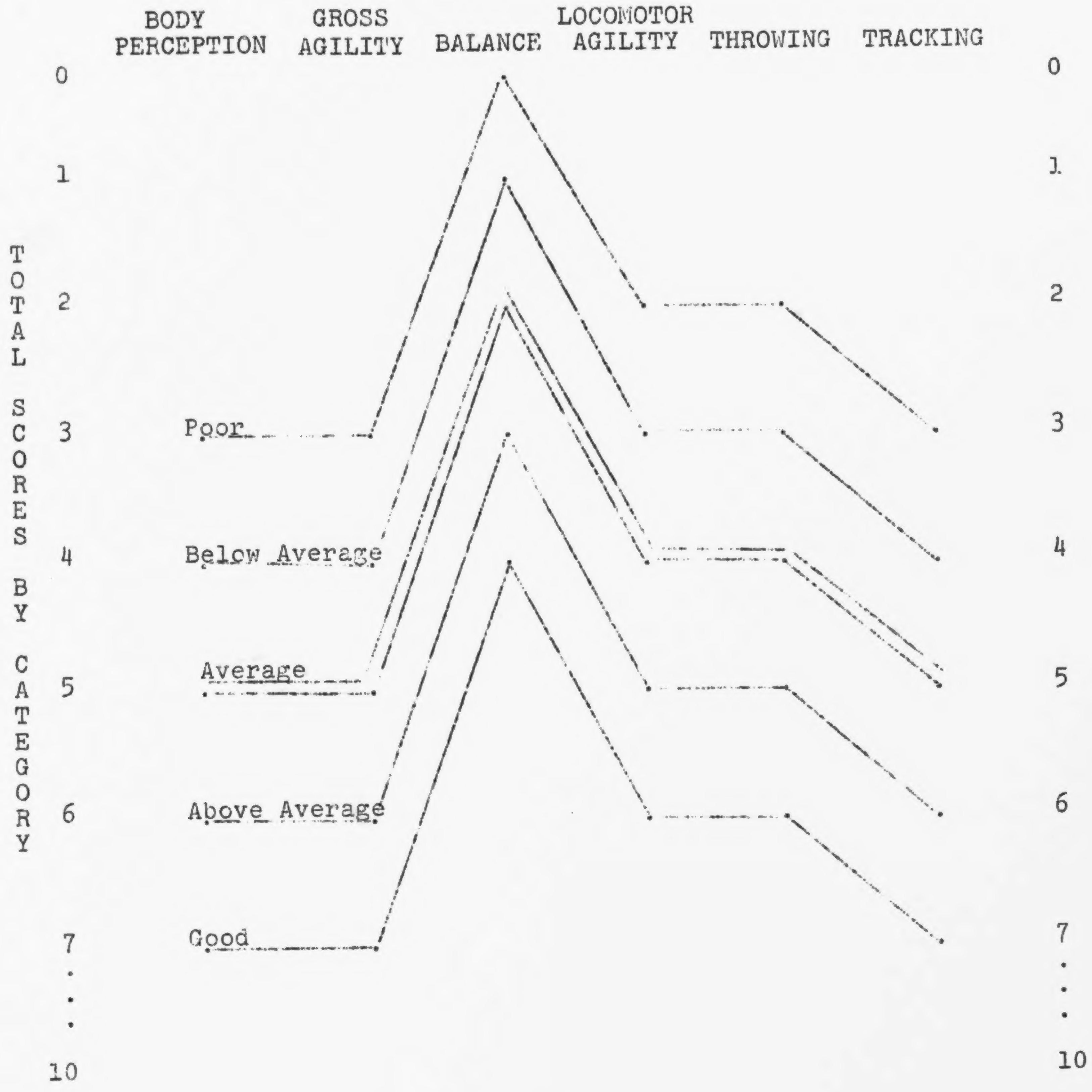
NORMS OF THE TRAINABLE MENTALLY RETARDED BY TEST, AGES 5-6 YEARS



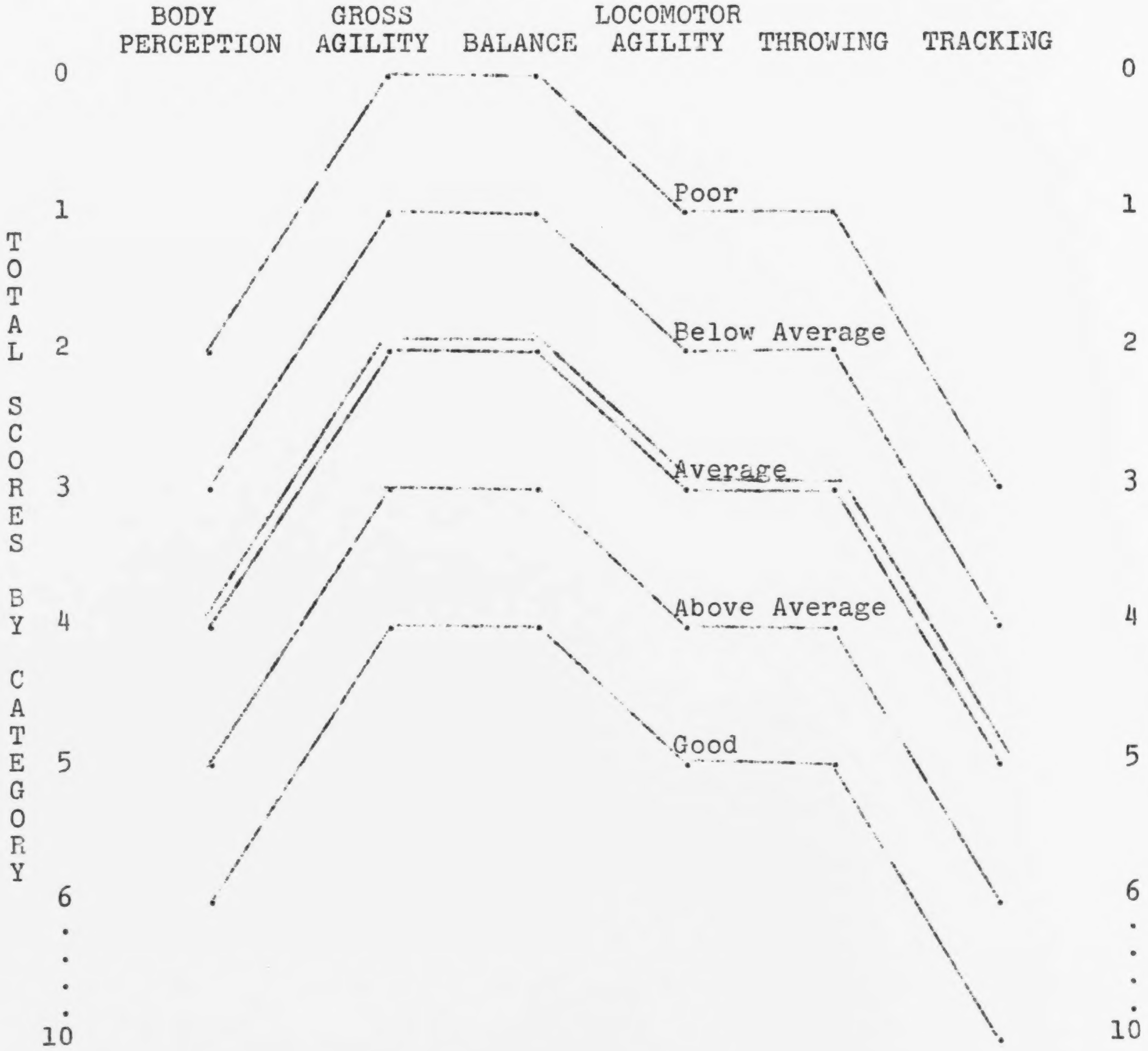
NORMS OF THE EDUCABLY MENTALLY RETARDED BY TEST, AGES 9-14 YEARS



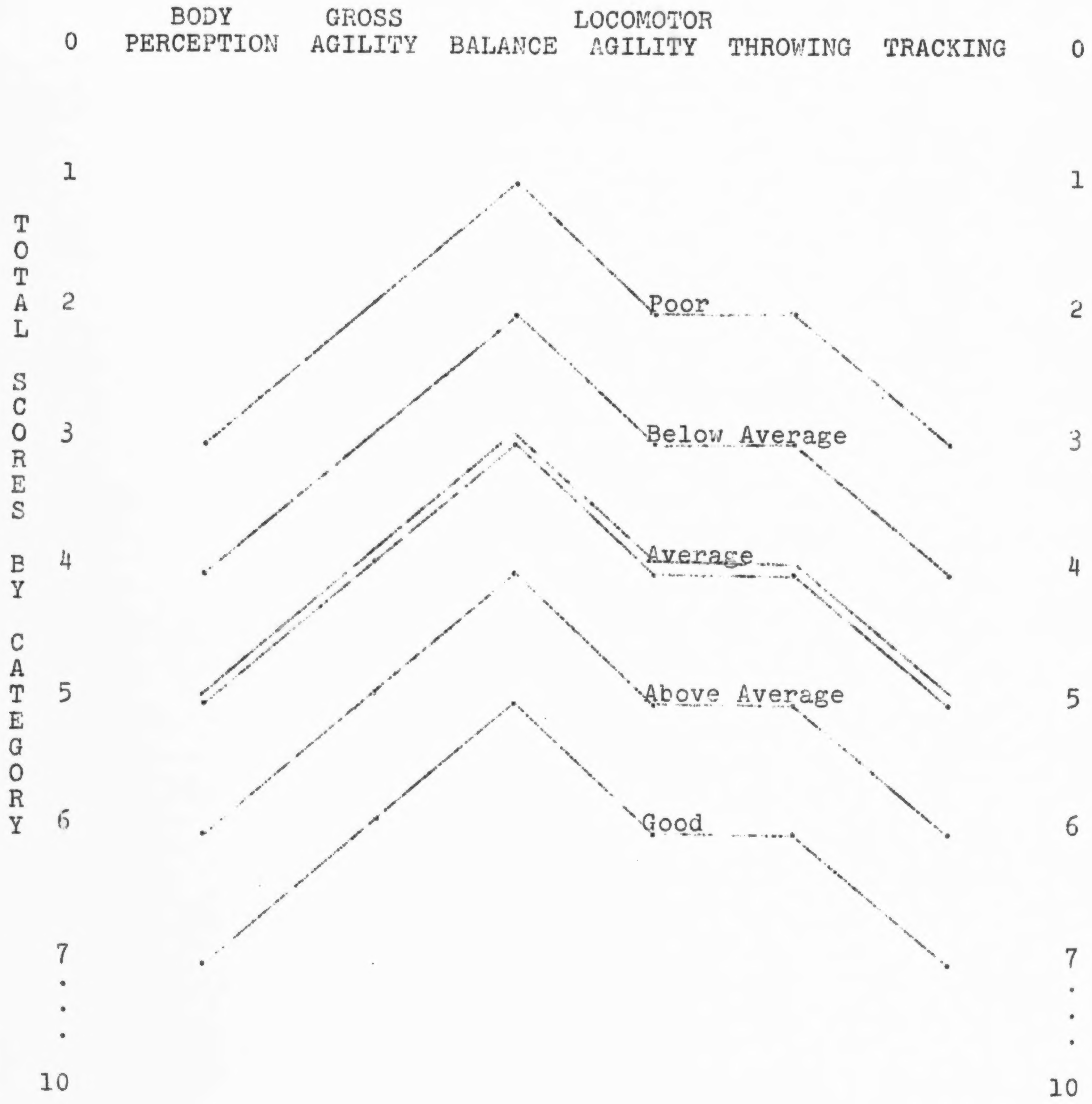
NORMS OF THOSE WITH DOWN'S SYNDROME
BY TEST, AGES 15-20 YEARS



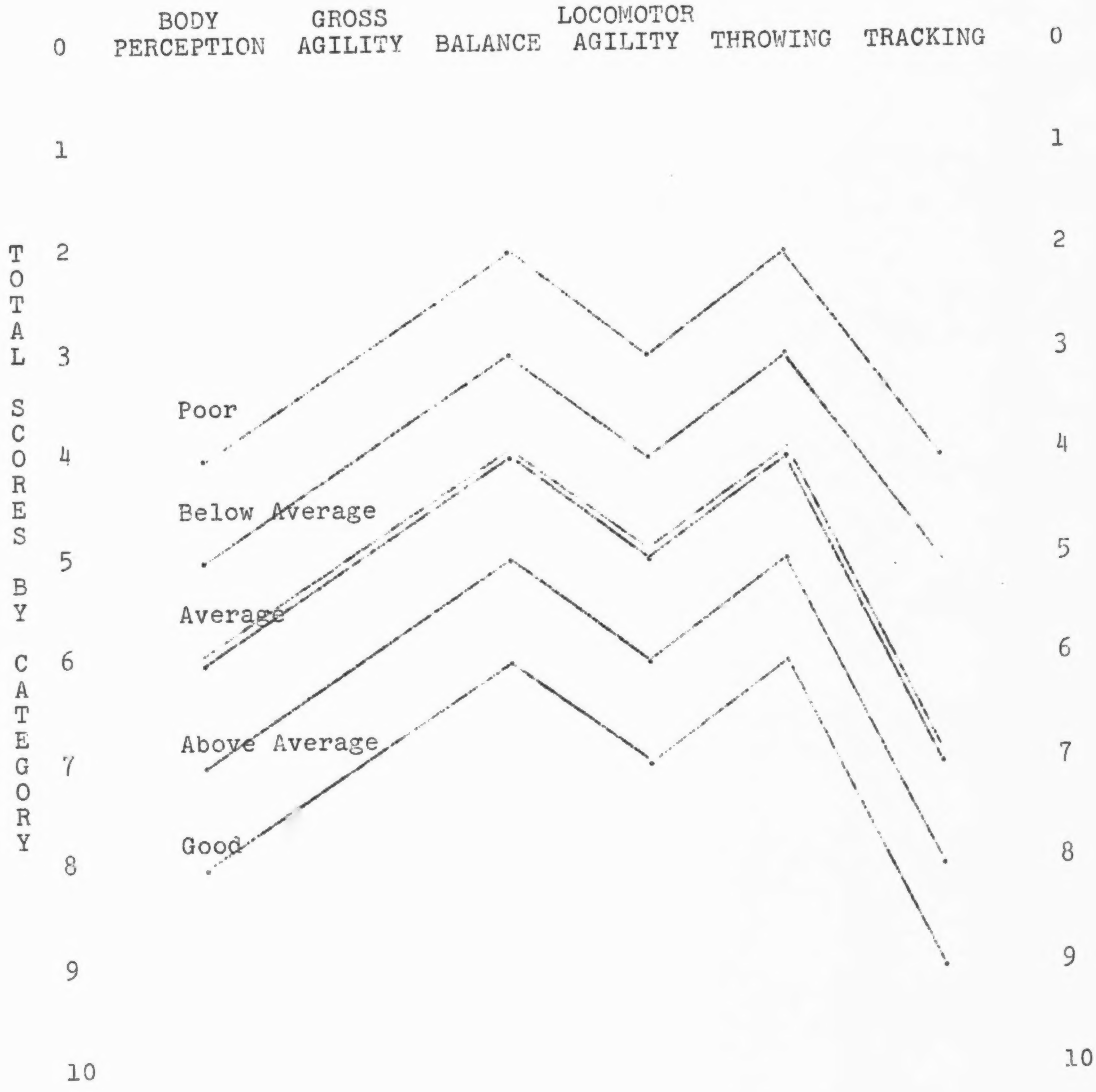
NORMS OF THOSE WITH DOWN'S SYNDROME
BY TEST, AGES 9-14 YEARS



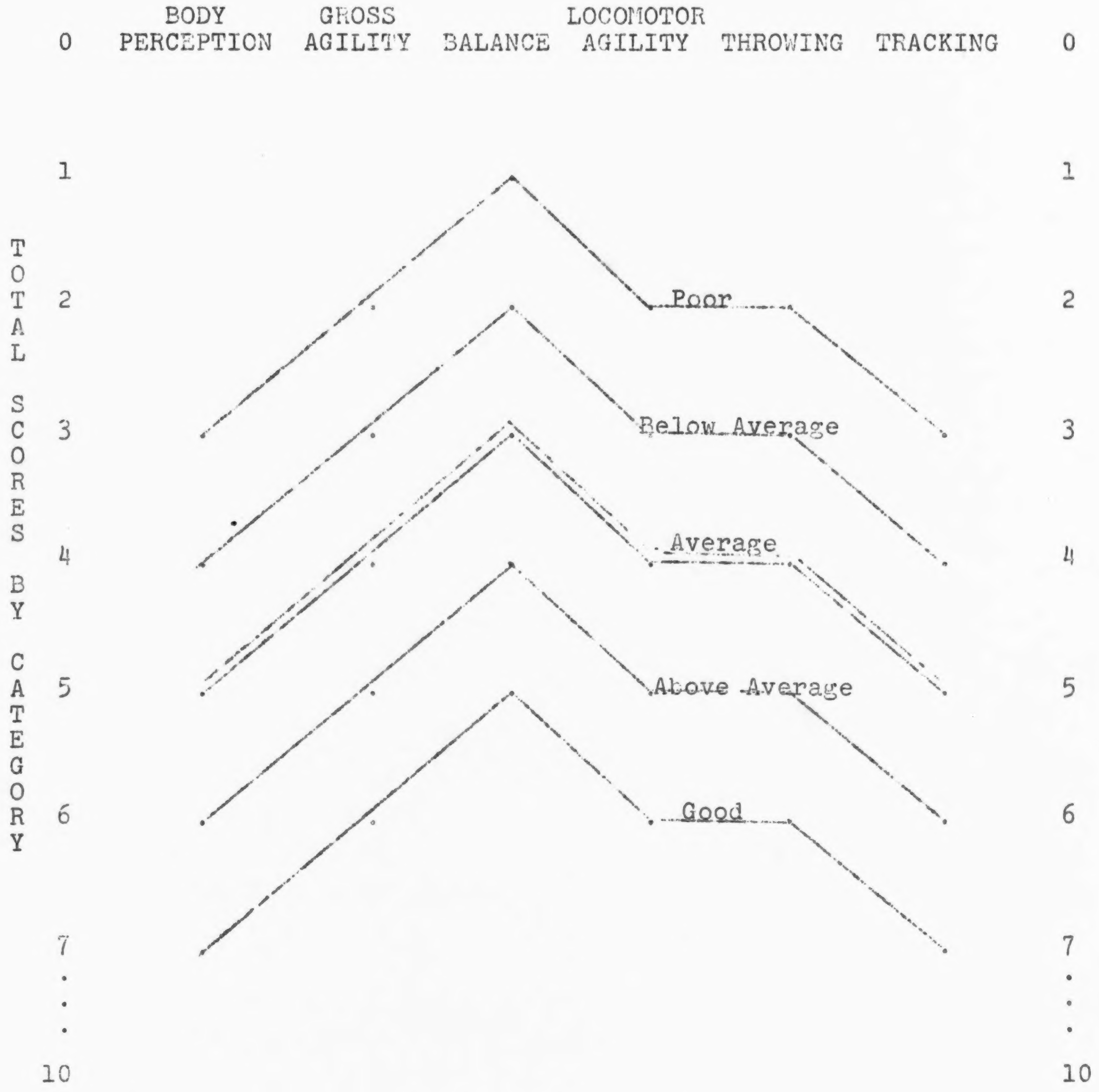
NORMS OF THE TRAINABLE MENTALLY RETARDED
BY TEST, AGES 9-16 YEARS



NORMS OF THE TRAINABLE MENTALLY RETARDED
BY TEST, AGES 17-24 YEARS



NORMS FOR THE TRAINABLE MENTALLY RETARDED
BY TEST, AGES 9-16 YEARS



APPENDIX D

Miscellaneous Tables

TABLE A
MEANS AND STANDARD DEVIATIONS, FOR THE TOTAL SUBJECT POPULATION, AND FOR SELECTED SUB-GROUPS BY TEST AND FOR THE TOTAL TEST BATTERY

	B.P.		G.A.		BAL.		L.A.		THROW.		TRACK.	
	M		M		M		M		M		M	
EMR	6.54	2.18	6.97	2.30	6.47	2.54	6.27	2.5	5.8	2.19	7.38	2.16
TMR	4.14	2.69	3.66	2.89	2.72	2.71	2.73	2.28	3.14	1.89	4.71	2.93
EH	6.27	2.31	6.56	3.22	5.68	3.08	6.60	2.66	5.91	2.43	8.02	1.28
CP	4.27	1.99	2.52	2.74	2.5	2.75	2.75	1.58	2.73	1.16	3.19	2.98
NEG	4.86	1.95	5.0	2.91	4.48	3.70	5.23	2.52	4.64	1.97	6.1	3.2
BOY	5.19	2.7	4.99	2.95	4.28	3.3	4.8	2.33	4.78	2.72	6.26	2.74
GIRL	4.76	2.92	5.05	3.42	4.1	3.42	5.4	3.3	3.61	2.2	5.96	2.73
DS	3.66	1.7	3.16	2.37	1.42	1.82	3.38	1.79	3.2	1.84	4.21	1.6
TOTAL SUBJ	5.04	2.10	5.0	2.36	4.22	3.0	4.93	2.35	4.93	2.18	6.16	2.36

TOTAL BATTERY	M	
EMR	37.86	4.95
TMR	19.71	11.77
EH	37.89	13.64
CP	15.38	12.65
NEG	27.24	18.15
BOY	27.43	14.15
GIRL	27.85	13.86
DS	14.55	8.91
TOTAL SUBJ.	29.55	11.02

TABLE B
MEANS AND STANDARD DEVIATIONS OF THE EMR's GROUPED BY AGE IN THE SIX TESTS, AND IN THE TOTAL BATTERY

	B.P.		G.A.		BAL.		L.A.		THROW.		TRACK.	
	M		M		M		M		M		M	
5-8	5.67	.92	6.67	2.28	5.17	.97	5.83	2.12	5.83	2.62	7.0	2.77
9-10	6.73	2.45	7.07	1.83	6.80	2.23	6.47	1.88	5.33	2.61	7.87	1.88
11-14	7.5	2.12	7.6	1.85	7.2	2.52	5.9	2.91	6.6	2.15	6.5	2.16
15-20	6.6	1.49	6.2	2.79	5.2	2.23	5.6	2.24	5.8	1.94	5.6	1.20

	TOTAL BATTERY	
AGE	M	
5-6	33.03	19.85
9-10	38.19	6.88
11-14	41.95	8.52
15-20	32.95	8.80

B.P.=Body Perception

G.A.=Gross Agility

Bal.=Balance

L.A.=Locomotor Agility

Throw.=Throwing

Track.=Tracking

TABLE C
MEANS AND STANDARD DEVIATIONS, OF THE EDUCATIONALLY HANDICAPPED CHILDREN, GROUPED BY AGE, IN THE SIX TESTS AND IN THE TOTAL BATTERY

AGE	B.P.		G.A.		BAL.		L.A.		THROW.		TRACK.	
	M		M		M		M		M		M	
5-8	3.25	.64	2.63	1.31	2.4	1.93	2.88	1.45	3.25	2.25	4.86	2.16
9-10	5.0	2.45	5.9	3.36	6.55	1.70	6.8	2.14	5.8	1.6	8.5	1.28
11-12	7.8	1.78	8.6	1.74	8.0	1.95	8.8	1.33	7.1	1.51	9.6	4.9
13-16	8.0	1.53	8.5	2.06	5.81	3.3	6.67	2.49	7.17	1.94	9.17	.64

	TOTAL BATTERY	
AGE	M	
5-8	13.95	6.71
9-10	41.95	9.18
11-12	48.87	16.83
13-16	44.23	8.14

B.P.=Body Perception

G.A.=Gross Agility

Bal.=Balance

L.A.=Locomotor Agility

Throw.=Throwing

Track.=Tracking

TABLE D
MEANS AND STANDARD DEVIATIONS, OF THE EMR's, GROUPED BY AGE, IN THE SIX TESTS AND IN THE TOTAL BATTERY

AGE	B.P.		G.A.		BAL.		L.A.		THROW.		TRACK.	
	M		M		M		M		M		M	
5-6	3.18	2.33	2.50	2.13	2.43	2.42	2.35	.91	2.29	.9	2.62	2.29
7-8	3.21	1.46	2.56	2.72	1.95	2.01	3.25	1.90	3.11	2.16	3.20	2.34
9-10	4.53	2.55	4.52	1.79	3.24	2.45	3.77	2.88	3.25	2.25	5.59	2.89
11-12	3.33	1.68	3.09	2.25	1.76	1.92	3.45	1.69	2.85	1.68	4.47	2.79
13-14	5.38	2.51	3.76	2.79	3.61	2.90	4.15	2.66	4.07	2.02	5.61	2.03
15-16	5.4	1.5	2.15	4.7	2.8	2.64	4.2	2.52	4.2	1.99	5.3	2.33
17-20	5.87	1.92	5.12	4.1	4.37	2.4	5.12	2.1	4.25	2.34	6.0	3.39
21-24	5.57	2.2	5.14	2.57	4.42	3.9	5.0	2.27	4.14	1.25	7.33	1.9

	Total Battery	
AGE	M	
5-6	14.42	10.06
7-8	15.96	11.88
9-10	20.65	11.93
11-12	16.30	10.78
13-14	25.78	12.82
15-16	21.20	14.19
17-20	32.12	10.28
21-24	31.19	12.54

B.P.=Body Perception
G.A.=Gross Agility
Bal.=Balance

L.A.=Locomotor Agility
Throw.=Throwing
Track.=Tracking

TABLE E
MEANS AND STANDARD DEVIATIONS OF THE CHILDREN WITH DOWN'S SYNDROME, BY AGE IN THE SIX TESTS AND IN THE TOTAL BATTERY

AGE	B.P.		G.A.		BAL.		L.A.		THROW.		TRACK.	
	M		M		M		M		M		M	
5-8	2.86	.82	2.14	.65	1.43	.73	2.63	2.31	2.62	1.01	2.5	2.06
9-12	3.5	1.2	1.5	1.28	1.8	1.25	3.0	1.71	2.45	1.17	4.64	.62
13-14	3.5	.5	2.0	1.0	1.83	1.07	2.83	.91	3.5	2.06	4.5	1.5
15-18	5.14	1.65	4.85	2.66	1.86	2.16	3.0	1.63	4.7	2.98	4.29	1.14
19-22	4.75	1.92	4.5	2.06	2.0	2.74	4.5	.5	3.0	1.22	6.0	.81

AGE	TOTAL BATTERY	
	M	
5-8	13.95	4.79
9-12	15.46	6.71
13-14	16.23	5.0
15-18	21.11	13.03
19-22	21.76	4.32

B.P.=Body Perception
G.A.=Gross Agility
Bal.=Balance

L.A.=Locomotor Agility
Throw.=Throwing
Track.=Tracking

TABLE F
COMPARISON OF THE MEAN SCORES, BY TEST, OF CHILDREN
CLASSIFIED AS EMR TO THE MEAN SCORES OF THE TMR'S

TEST	TYPE	M	σ	σM	σdiff.	M_1-M_2	t	p
BODY PERCEPTION	EMR	6.54	2.18	.39	.44	2.4	5.45	.001
	TMR	4.14	2.69	.25				
GROSS AGILITY	EMR	6.97	2.30	.41	.49	3.31	6.76	.001
	TMR	3.66	2.89	.27				
BALANCE	EMR	6.47	2.54	.45	.52	3.75	7.21	.001
	TMR	2.72	2.71	.26				
LOCOMOTOR AGILITY	EMR	6.27	2.5	.44	.49	3.54	7.22	.001
	TMR	2.73	2.28	.22				
THROWING	EMR	5.8	2.16	.39	.42	2.66	6.33	.001
	TMR	3.14	1.89	.18				
TRACKING	EMR	7.38	2.16	.38	.48	2.67	5.56	.001
	TMR	4.71	2.93	.28				
TOTAL BATTERY	EMR	37.86	4.95	.30	1.20	18.51	15.42	.001
	TMR	19.71	11.77	1.17				

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TABLE G
COMPARISON OF THE MEAN SCORES, BY TEST, OF CHILDREN CLASSIFIED AS EH TO THE MEAN SCORES OF THE TMR'S

TEST	TYPE	M	σ	σM	σ diff.	M_1-M_2	t	p
BODY PERCEPTION	EMR	6.27	2.31	.39	.44	2.07	4.70	.01
	TMR	4.14	2.69	.25				
GROSS AGILITY	EMR	6.56	3.22	.54	.62	2.90	4.68	.01
	TMR	3.66	2.89	.27				
BALANCE	EMR	5.68	3.08	.52	.58	2.96	5.10	.01
	TMR	2.72	2.71	.26				
LOCOMOTOR AGILITY	EMR	6.6	2.66	.45	.52	3.87	7.44	.01
	TMR	2.73	2.28	.22				
THROWING	EMR	5.91	2.43	.41	.44	2.77	6.30	.01
	TMR	3.14	1.89	.18				
TRACKING	EMR	8.02	1.28	.22	.36	3.31	9.19	.01
	TMR	4.71	2.93	.28				
TOTAL BATTERY	EMR	37.89	13.64	2.24	2.96	18.18	6.14	.01
	TMR	19.71	11.77	1.94				

TABLE H

COMPARISON OF THE MEAN SCORES OF THE CHILDREN WITH DOWN'S SYNDROME TO THE MEAN SCORES OF THE TRAINABLE MENTALLY RETARDED

		M.	σ	σm	M_1-M_2	σ diff.	t	p.
BODY PERCEPTION	TMR	4.69	2.51	.58	.69	.69	1	NS
	DS	4.0	1.45	.36				
GROSS AGILITY	TMR	4.27	2.28	.52	1.99	.72	2.76	.01
	DS	3.36	2.29	.50				
BALANCE	TMR	3.14	2.93	.67	1.23	.79	1.56	NS
	DS	1.91	1.90	.41				
LOCOMOTOR AGILITY	TMR	3.95	2.03	.47	.68	.60	1.13	NS
	DS	3.27	1.33	.37				
THROWING	TMR	4.95	1.99	.46	1.54	.64	2.41	.05
	DS	5.41	2.08	.45				
TRACKING	TMR	5.82	2.49	.57	2.68	.65	4.12	.01
	DS	3.14	1.42	.31				
TOTAL	TMR	24.92	11.1	2.55	1.22	3.08	.40	NS
	DS	23.7	7.90	1.72				

TABLE I
COMPARISON OF THE HIGHEST TO THE LOWEST SCORES ACHIEVED BY THE CHILDREN WITH DOWN'S SYNDROME, BY AGE

TEST	AGES	M	σ	σM	σ diff.	M_1-M_2	t	p
BODY PERCEPTION	5-8	2.86	.82	.31	.74	2.28	3.08	.01
	15-18	5.14	1.65	.67				
GROSS AGILITY	9-12	1.5	1.28	.43	.86	3.35	3.89	.01
	15-18	4.85	1.86	.75				
BALANCE	5-8	1.43	.73	.27	1.60	.57	.36	N/S
	19-24	2.0	2.73	1.58				
LOCOMOTOR AGILITY	5-8	2.63	2.31	.88	.92	1.87	2.03	N/S
	19-22	4.50	.50	.28				
THROWING	9-12	2.45	1.17	.39	1.28	2.25	1.76	N/S
	15-18	4.70	2.98	1.22				
TRACKING	5-8	2.50	2.06	.78	.91	3.50	3.85	.01
	19-22	6.0	.81	.47				
TOTAL BATTERY	5-8	13.95	4.78	1.81	2.83	7.42	2.62	.05
	19-22	21.37	4.32	2.49				

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